october 1958

nlgi spokesman

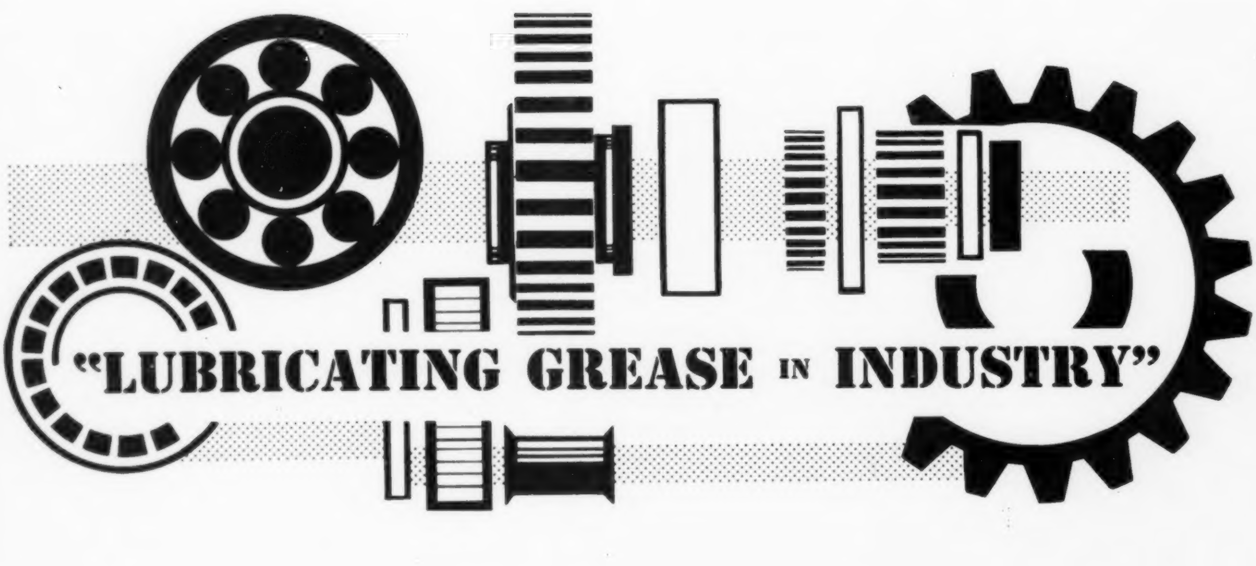
journal of the national lubricating grease institute

26th annual meeting

national lubricating grease institute

october 27-29, 1958

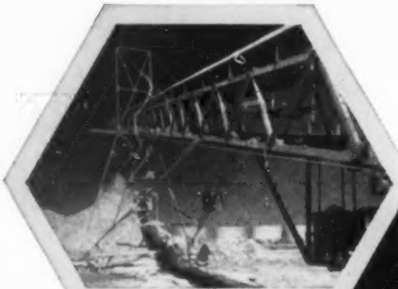
edgewater beach hotel, chicago



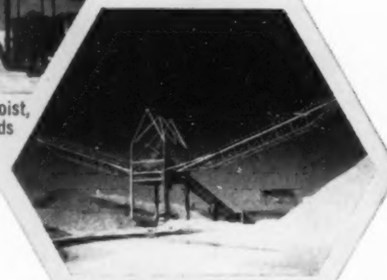
25th anniversary

1933-1958

"In 30 months...not a single bearing lubrication failure with lithium-base grease!"



Conveyor-stacker handling moist, sticky material which builds up on the rollers.



Ore unloading conveyor rollers handling 200 tons of ore per hour.

THE PROOF IS IN THE PERFORMANCE...

lithium-base grease does the job...

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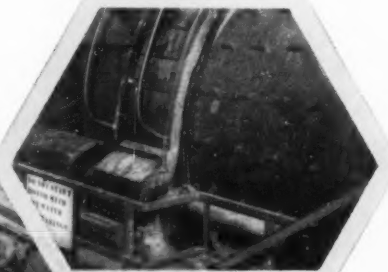

Pinion gear transmitting power from 600 h.p. motor to a ball mill.

Pan Conveyor handling hot clinker (1600°F), roller bearings in dusty, moist atmosphere.

Leach tanks handling hot slurry, agitators driven by Falk gear reducing units.

V.A. Wemco classifier, part of wet grinding system, lower bearing submerged in hot sludge.

Here's a report of our own experience with lithium-base grease under extreme industrial service conditions. Approximately 95% of the grease used in the plant of American Lithium Chemicals, Inc., our subsidiary at San Antonio, Texas, is lithium-base, one-type grease. In thirty months operation we have not been able to trace a single cause of bearing failure to the lubricant used. The on-the-spot photos above give graphic evidence of the rugged bearing service requirements in this plant where lithium ores are processed into high-grade lithium hydroxide, itself an important ingredient in lithium-base grease. Performance like this is why grease chemists, manufacturers, marketers and users all attest to the superiority of lithium-base...the *one* grease in place of *many* for efficient and economical operation.

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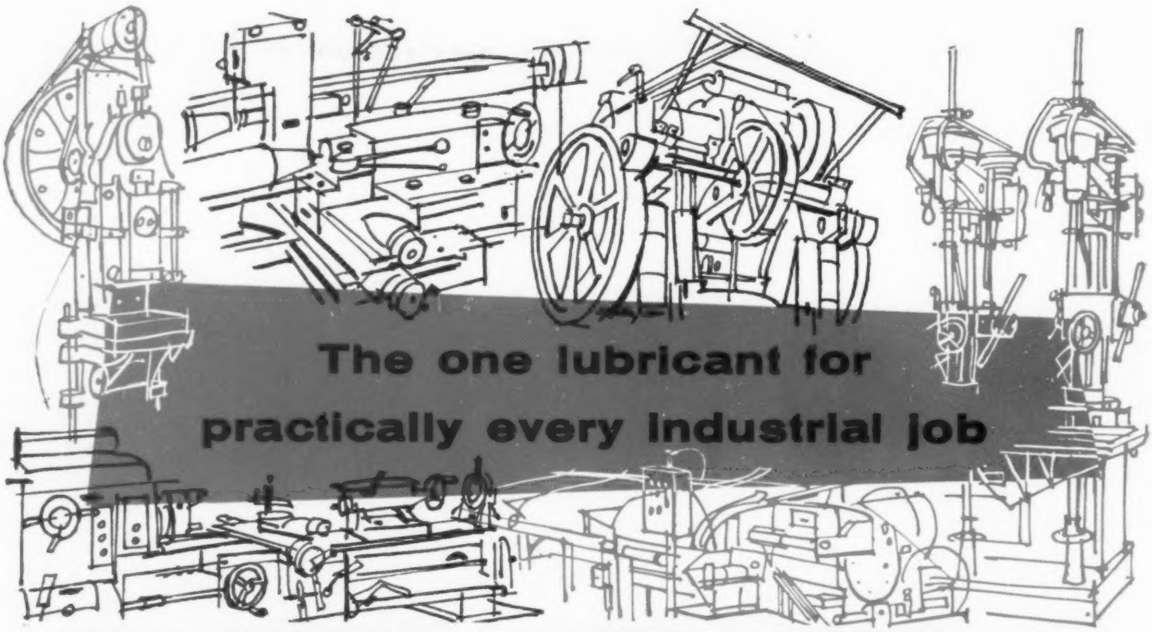

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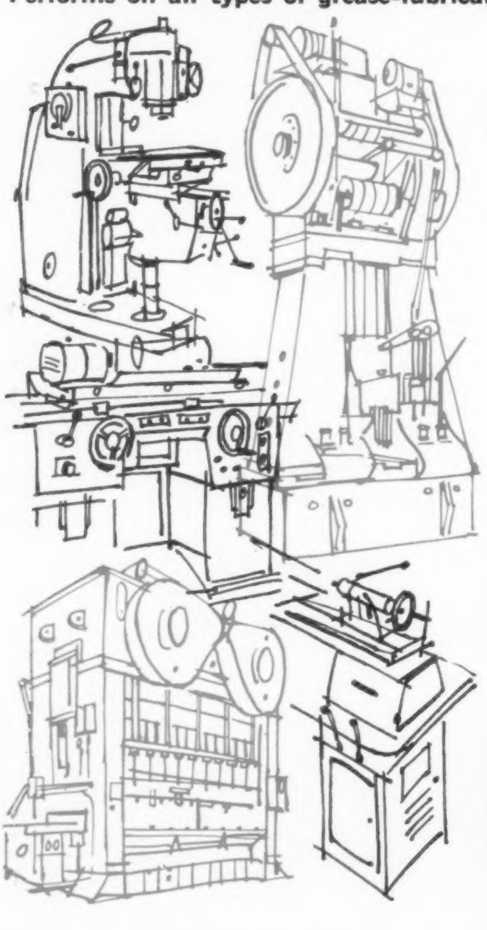

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- **Unusual stability** against oxidation and softening—even under very rugged conditions
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Metasap 537 For firm greases without cracking or bleeding

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NLGI PRESIDENT'S PAGE

By R. CUBICCIOTTI, *President*

ONE YEAR

If anyone is interested in a way to foreshorten time, let him speak to an outgoing President of the Institute. The year practically whizzes by, marked by a succession of President's Pages, of which this is my twelfth and last.

My thoughts at this time are random, rather than focused on any specific theme. I am overwhelmed with the many ideas I would like to express, and the limitations of space in which to express them.

Although we are all exhorted to think ahead and not to live in the past, I cannot fail to look back on the last twelve months and express these thoughts.

Nineteen fifty-eight was a very special year in the life of the National Lubricating Grease Institute—its twenty-fifth.

There is a strong inclination to label it the "best" year we ever had, but those of us who know the history of the Institute are on guard against such superlatives. We know that every year has been a fine one for the Institute, each in its own way, each furthering the objectives of an organization which is without peer in its steadfast progress toward its goals.

Be that as it may, we cannot complete the year without a vote of thanks to the hundreds of people who, with devotion, did the thousands of things which make up the Institute's year.

Without naming names, with all its inherent dangers, I would like to recall to you the work of the Institute office and its staff, the faithful Officers and Directors, who not only attended meetings of the Board, but who also were members on an average of three working committees, the members of the Technical Committee, with its many sub-committees, the personnel at the University of Utah, working on our fellowship, and the speakers at our Annual Meeting.

And now let us look ahead—this time to our next Annual Meeting. I hope that as you read these lines, you have completed your plans to be present as the National Lubricating Grease Institute begins its second quarter-century of service.

Better Water-Resistant Greases With ADM's Hydrofol AB Acid

Many grease manufacturers have discovered how ADM Hydrofol AB Acid improves their water-resistant sodium and aluminum-based greases. The reason is that Hydrofol AB Acid is a combination of fatty acids with chain lengths ranging from C-14 to C-22. The C-20 and C-22 acids (arachidic and behenic) make up more than half of the total mixture.

This blend gives a far different structure than acids dominantly of one chain length. Hydrofol AB Acid gives you a mixture of desirable characteristics, with improved solubility plus really remarkable water repellency. Manufacturers of greases for water pumps, springs, wheel bearings, chassis, steering mechanisms, ball or roller bearings, and other places where water resistance is essential have turned to Hydrofol AB Acid to solve their problems.

These same manufacturers have learned to rely on ADM's leadership, reputation, and consistent quality. If you somehow have missed doing business with ADM, chances are you have a pleasant treat ahead of you. Find out for yourself why so many people in the grease industry order their fatty acids from ADM. And, for your future reference, here are the specifications for Hydrofol AB Acid:

SPECIFICATIONS

Titer	60-63 °C
Acid Value	178-185
Iodine Value	5 Max
Saponification Value	179-186
Spec Grav 100/20°C (av)	0.828
Color 5¼" Lovibond	25Y-2.5R
Calculated Molecular Wt.	302-314

ADM PRODUCTS: Linseed, Soybean and Marine Oils, Synthetic and Natural Resins, Fatty Acids and Alcohols, Vinyl Plasticizers, Hydrogenated Glycerides, Sperm Oil, Foundry Binders, Bentonite, Industrial Cereal, Vegetable Proteins, Wheat Flour, Dehydrated Alfalfa, Livestock and Poultry Feeds.

Archer-Daniels-Midland

Hydrofol Products

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Chemifats from Nature's Wondrous Warehouse

nlgi spokesman

Volume XXII OCTOBER, 1958 Number 7

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THE COVER

WHEELS and gears of industry as depicted in the cover illustration would not turn for any length of time without the aid of lubricating grease. This year the 26th Annual Meeting of the National Lubricating Grease Institute will focus its attention on the theme "Lubricating Grease in Industry." Included in the program will be papers dealing with the problems of gear manufacturers, lubricants suppliers and the industrial consumer. In a joint session with AGMA, the various viewpoints will be aired to help solve these problems and improve potential markets of the industry.

News About NLGI

NLGI Representative Changes Announced

Cities Service Oil company has named Mr. A. G. Griswold as their NLGI Company Representative. Mr. B. H. Rosen is the firm's Technical Representative.

Joseph Dixon Crucible company has appointed Mr. Earl L. Youse as their representative on the NLGI Technical Committee.

Mallinckrodt Chemical Works has placed Mr. A. G. Jehle on the NLGI Technical Committee.

British American Oil company has named Mr. L. R. Woolsey, director of direct sales, as NLGI Company Representative.

Constitution Amendment Ballots to Members

Active members of the Institute received ballots last month covering a series of proposed amendments to the NLGI Constitution and By-Laws which, if favorably received, will make possible several improvements in the overall operation. The modifications include enlargement of the board of directors, the election of a secretary, and a more definative section on the Institute's paid executive.

Board Enlargement—for 25 years the representation on the Institute's governing body has been set at a maximum of eighteen directors. Since 1933 however, NLGI has more than quadripled in growth and its sphere of interests continues to expand. Since the board members are part of a "working" group, the proposal to enlarge the board from eighteen to an eventual 24 not only recognizes the Institute's growth but provides additional assistance for current and future programs.

Elected Secretary—this is to comply with Ohio statutes for not-for-profit corporations, in the state where NLGI is incorporated.

General Manager—to eliminate possible confusion between a "Secretary" and an "Executive Secretary" the title of the Institute's managing executive would be changed to "General Manager" under the new amendment.

If the Active member firms vote in the affirmative on the amend-

Continued on page 311

SERVICE AIDS

Send Orders to: National Lubricating Grease Institute, 4638 Nichols Parkway, Kansas City, Mo.

NLGI MOVIE — "Grease, the Magic Film," a 16-mm sound movie in color running about 25 minutes, now released. First print $600, second print $400, third and subsequent orders $200 each (non members add $100 to each price bracket).

VOLUME XX — Bound volume of the NLGI SPOKESMAN from April, 1956 through March, 1957. An excellent reference source, sturdily bound in a handsome green cover . . . $7.00 (NLGI member price) and $10.00 (non-member) plus postage.

VOLUME XXI—Bound volume of the NLGI SPOKESMAN from April, 1957 through March, 1958. Contains 34 articles and features dealing with lubricating greases and gear lubricants . . . $7.00 (NLGI member price) and $10.00 (non-member) plus postage.

BONER'S BOOK—Manufacture and Application of Lubricating Greases, by C. J. Boner. This giant, 982-page book with 23 chapters dealing with every phase of lubricating greases is a must for everyone who uses, manufactures or sells grease lubricants. A great deal of practical value. $18.50, prepaid.

News About NLGI Continued

Constitution Amendment

Continued from page 309

ments, they will be enacted beginning with the 1958 Annual Meeting in Chicago. The 1958 Nominating Committee has suggested a slate of three additional directors and over and above the usual six directors selected, making a total of nine to be voted on at the Annual Meeting. The nine, serving with twelve previously elected directors, would make a total of 21 men to serve in 1958-59. Directors serve for a three-year term.

This is the second set of amendments offered to the Active membership . . . the first was ratified by letter ballot in 1955. Amendments may be passed by affirmative vote of two-thirds of Institute Active members.

Slate for '59 Announced

The 1958 Nominating Committee has introduced a proposed slate of officers and board members for the year to come, to be voted on at the Annual Business Meeting at the Edgewater Beach hotel in Chicago, Monday, October 27. The position of elected secretary, and three of the board positions created are subject to passage of amendments to the Constitution and By-Laws, before the election.

To be 27th president of the Institute, the committee nominated Mr. F. E. Rosenstiehl, sales manager, lubrication sales division, the Texas company. Mr. Rosenstiehl has been a member of the board of directors since 1950, has served on some ten NLGI committees, and is currently serving as vice president and program chairman for the Institute.

For the position of vice president and program chairman, the committee nominated Mr. H. A. Mayor, Jr., executive vice president, Southwest Grease and Oil. Mr.

Continued on page 354

Future Meetings

OCTOBER, 1958

6-7 Packaging Institute, Petroleum Packaging Committee, Sheraton - Fontenelle Hotel, Omaha.

12-14 Oil Progress Week

13-15 ASLE-ASME Joint Lubrication Conference, Hotel Statler, Los Angeles, Calif.

20-22 SAE National Transportation Meeting, Lord Baltimore Hotel, Baltimore, Md.

22-24 SAE National Diesel Engine Meeting, Lord Baltimore Hotel, Baltimore, Md.

27-29 NLGI Annual Meeting, Edgewater Beach Hotel, Chicago, Ill.

NOVEMBER, 1958

5-6 SAE, national fuels and lubricants meeting, the Mayo Hotel, Tulsa.

6-8 National Oil Jobbers Council, Conrad Hilton Hotel, Chicago.

10-12 API annual meeting, Conrad Hilton Hotel, Chicago.

30-Dec. 5 ASME, annual meeting, Statler and Sheraton-McAlpine hotels, New York City.

JANUARY, 1959

25-27 ASLE gear symposium, Hotel Morrison, Chicago.

FEBRUARY, 1959

2-6 ASTM National Meeting, William Penn Hotel, Pittsburgh, Pa.

26-27 API Division of Marketing, Lubrication Committee Meeting.

***MARCH, 1959**

3-5 SAE Passenger Car, Body, and Materials Meeting, Sheraton-Cadillac, Detroit, Mich.

APRIL, 1959

15-17 National Petroleum Association, Semiannual Meeting.

21-23 ASLE Annual Meeting and Exhibit, Hotel Statler, Buffalo, New York.

MAY, 1959

4-6 API Division of Marketing, Lubrication Committee Meeting.

15-24 International Petroleum Exposition

27-29 API Division of Marketing, Midyear Meeting.

31-June 6 Fifth World Petroleum Congress.

JUNE, 1959

14-19 SAE Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

APRIL, 1960

19-21 ASLE Annual Meeting and Exhibit, Netherland-Hilton Hotel, Cincinnati, Ohio.

JUNE, 1960

26 ASTM National Meeting with Exhibit, Chalfonte-Haddon Hall, Atlantic City, N. J.

OCTOBER, 1960

3-5 ASLE-ASME Joint Lubrication Conference, Hotel Morrison, Chicago, Ill.

*Tentative

Previews . . . 26th

NLGI ANNUAL MEETING

Edgewater Beach   Chicago   October 27-29

1933—A Quarter-Century of Service—1958

PROGRAM

Monday Morning

10 a.m.

Address of Welcome—R. Cubicciotti
Social Maturity for the Corporation—R. Dinsmore
A Preformed Organic Thickener

Monday Afternoon

2 p.m.

Scientific Detection in Grease Lubricating Problems
Milling of Grease
(a) The Mechanisms of Dispersion
(b) Practical Application of Milling
Facts and Factors in Grease Manufacturing Costs
Gas Chromatography for Analysis of Fatty Acids
Annual Business Meeting

Tuesday Morning

9 a.m.

Joint Meeting with AGMA—Industrial Gear Lubrication
Board of Directors Meeting

Tuesday Afternoon

2 p.m.

Fundamental Research session to run concurrently with General Session.

Lubricate for Safety Every 1,000 Miles
(a) From the Service Station Dealer's Viewpoint
(b) From the Car Dealer's Viewpoint

Two Tons of Grease

Future Grease Requirements
(a) Market Potential for Automotive Grease
(b) Future Grease Requirements in the Steel and Underground Coal Mining Industries
(c) Current and Future Military Requirements

Development of Extreme Pressure Greases

Fundamental Research Session Papers

An Equation Fitting the Flow of Lubricating Greases in Viscometers and Pipes
Yield Point of Lubricating Greases
Pressure and Temperature Effects on the Flow Properties of Grease
Comparison of Temperature Effects on the Flow Properties of Greases in Capillary and in Cone and Plate Viscometers.
Social Hour
Annual Banquet

Wednesday Morning

9 a.m.

Technical Committee Session

CONCLUDING NLGI's twenty-fifth anniversary year celebration is the Annual Meeting, the Institute's 26th. Following the tradition of concentrating on better grease lubrication engineering service to industry, the theme of this meeting has been chosen as "Lubricating Grease in Industry" and features a number of timely papers in cooperation with the American Gear Manufacturer's Association . . . a symposium on rheology . . . several marketing papers of particular interest . . . and the social hour and banquet. Shown on the following pages are most of the presentations and the men making them.

"LUBRICATING GREASE IN INDUSTRY"

Dinsmore

Social Maturity For the Corporation

By DR. R. P. DINSMORE, Goodyear Tire & Rubber Co.

R. P. Dinsmore received his BS degree in chemical engineering from the Massachusetts Institute of Technology in 1914 and an honorary English degree from Case Institute of Technology in 1940. From 1914 to 1916 he was with the technical staff of Goodyear Tire & Rubber company in Ohio. He held many positions in the company and rose to vice president, a position he has held since 1943. He is also vice president and director of the Goodyear Synthetic Rubber corporation and vice president and director of the Goodyear Atomic corporation. He is a member of ACS, SAE, Fellow AIC (President 1955-56), AICE (Director 1953-56), Fellow Royal Soc. Arts (Brit.), 1949, Fellow AAAS, Trustee, Midwest Research Institute since 1946, awarded the Colwyn Medal by Institute of the Rubber Industry, London, 1948, honorary membership AIC, 1953, Term member MIT corporation, 1954-1959 and was awarded the Charles Goodyear medal for 1955 by the rubber division of the American Chemical Society. He has contributed numerous articles on rubber to scientific magazines.

Abstract

The rubber industry and the lubricating grease industry have similar interests in facilitating the transmission of power, especially in vehicles and equipment devoted to transportation. There are more universal interests however which affect all industries and which will be chiefly considered in this discussion.

Corporations, like individuals, have characteristics and reputations important to success. Their influence on our society imposes obligations beyond legal requirements similar to those of a good citizen.

Problems having both business and sociological implications are fluctuations of the business cycle; the attitudes of organized labor; excessive income taxes; the cost of constantly improving old products and developing new ones; the adoption of new tools and methods to meet the present technological revolution; and the effects of foreign competition.

To mitigate sharp business fluctuations, each company should facilitate the rapid internal flow of accurate information and demand similar service from the government on industrial conditions generally. We need a positive approach to the labor problem to seek a solution.

In tax matters, we should better inform our employees and the public as to the general benefit of intelligent tax reform.

Management should know the possibilities of modern methods for research and development and for appraisal and control of other business functions. This will also reduce the dangers of foreign competition.

The technological revolution brings management under increasing pressure, but a mature approach to its problems should reduce competitive difficulties and constitute a great force for preserving our system of free enterprise.

Davis

Industrial Gear Lubrication (Panel Discussion)

By G. H. DAVIS, Shell Oil Company

G. H. Davis attended the Case School of Applied Science and graduated from the Case Institute of Technology in 1924 with a degree in mechanical engineering. He worked for Sinclair Refining company from 1924 to 1929. Since 1929 he has been with Shell Oil Company holding many locations and assignments, all in industrial lubrication. His present assignment is staff engineer, industrial products, handling marketing problems as they apply to heavy industry with particular emphasis on gear lubricants. Mr. Davis is a member of ASLE and the Association of Iron and Steel Engineers.

Abstract

Just as the gear manufacturers have improved the quality of their product, so have the lubricants manufacturers tremendously upgraded their lubricants. This has been a process of evolution and has gone on as a cooperative venture. It is not the purpose of this paper to discuss recent developments in gear lubricants, as this feature will be very ably discussed by Mr. Reynolds.

Design and Method of Lubrication

By J. H. ALLEN, Farrel Birmingham Company, Inc.

Industrial Gear Lubrication— From the Consumer's Viewpoint

By A. E. CICHELLI, Bethlehem Steel Corporation

Modern Techniques for Spray Lubricating Industrial Gears—"Dispensing Equipment Manufacturer's Viewpoint"

By E. J. GESDORF, The Farval Corporation

Lubrication of Rolling Mill Gears and Bearings

By JOHN H. HITCHCOCK, Morgan Construction Company

Reynolds

Recent Developments And Trends In Industrial Gear Lubrication

By E. S. REYNOLDS, Socony Mobil Oil Co., Inc.

E. S. Reynolds attended Syracuse university and is a graduate mechanical engineer. He is a licensed professional engineer in New York and Pennsylvania. At Socony Mobil Oil company, Inc., with whom he has been employed for 25 years he is senior engineering representative. A specialist on gears, gear lubrication and gear failures he has delivered numerous lectures on various gear subjects, including "Basic Causes of Gear Failures" before a number of technical societies, at several universities and for the Royal Canadian

Navy. Mr. Reynolds has made a world-wide study of gear production and performance, including England, France, Holland, Belgium, Germany, Norway and Sweden this past year.

Abstract

Developments in gear lubricants are very closely related to design trends and application practices in the gear industry. By projecting on the screen a model of two gear teeth in contact, we can study relative motion between the profile of these two teeth. This illustrates the slide and roll action, also the direction of slide and the sliding velocities. Also by projecting illustrations of gear teeth, the effect of pressure angle and long addendum on the mechanical strength of the tooth is obvious.

As gear design has been modified to meet modern requirements, lubricants have likewise progressed, and in recent years this has been primarily accomplished by the use of additives to petroleum oils. These additives have provided a considerable increase in antiwear and improved film formation between contacting surfaces. The proper selection of lubricants for modern gears becomes more critical and a complete understanding of the behavior of additives employed is necessary in the proper application of such lubricants. It has been common knowledge for many years that both pressure and temperature greatly affect the viscosity of an oil. The relationship between temperature and viscosity is quite common knowledge and used extensively today. Considerable thought is being given by ASTM and other technical groups to a uniform method of measuring pressure-viscosity. With the increased loadings on gear teeth, this pressure-viscosity relationship becomes more important. The resulting factual material will no doubt become as common as the present use of temperature-viscosity.

Brunstrum

An Equation Fitting The Flow of Lubricating Grease in Viscometers and Pipes

By L. C. BRUNSTRUM, DR. R. H. LEET and DR. A. W. SISKO, Standard Oil Company (Indiana)

L. C. Brunstrum has been a member of the research department of the Standard Oil company (Indiana) since he received his BS in chemical engineering from Armour Institute of Technology in 1929. He is currently the section leader in charge of research on greases and industrial lubricants. He is active in ASTM and is a member of the ACS, Society of Rheology and ASLE.

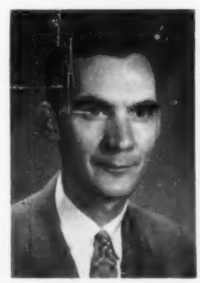
Leet

Sisko

R. H. Leet received his BS in chemistry at Northwest Missouri State college in 1948. He received his PhD in physical chemistry from the Ohio State university in 1952. After his graduation, he joined the Whiting Laboratories of the Standard Oil company (Indiana). He is currently group leader in the field of lubricating grease. He is a member of ACS, ASLE and the Society of Rheology.

A. W. Sisko received his AB in chemistry at Syracuse university in 1942. He received his PhD in physical chemistry from Case Institute of Technology in 1956. He is now in the research department of the Standard Oil company (Indiana) at Whiting. He is a member of the Society of Rheology, Sigma Xi and ASLE.

Bauer



Wiberly

Comparison of Temperature Effects on The Flow Properties of Greases in Capillary And in Cone and Plate Viscometers

By DR. W. H. BAUER, DR. S. E. WIBERLEY, A. P. FINKELSTEIN and D. O. SHUSTER, Rensselaer Polytechnic Institute

W. H. Bauer graduated from Oregon State college with a BS degree in chemical engineering in 1929. He received a PhD in physical chemistry from the University of Wisconsin. He was assistant instructor, University of Wisconsin, 1929-33; research assistant 1933-38; instructor, Rensselaer Polytechnic Institute,

1934-38; assistant professor 1938-42; captain, chemical welfare service, technical division research and development, U. S. Army; chief incendiary oil development section, pyrotechnic division; chief physical, analytical, and test divisions, Fred project rocket launching fuels, 1942-45; associate professor, Rensselaer Polytechnic Institute, 1945-48; professor, of physical chemistry, head physical chemistry division 1948-date. Consultant, chemical corps; industrial consulting. Dr. Bauer has done research on photochemical kinetics; fuels for rocket launching; chemistry, structure and fluid dynamics of aluminum soap-hydrocarbon incendiary fuels; rheology of non-Newtonian systems; conversion of boron hydrides by neutron radiation, oxidation of boranes and borane derivatives. He is a member of ACS, Society of the Sigma Xi, Phi Lambda Upsilon, AAAS and ASEE.

Finkelstein

Shuster

S. E. Wiberley received a BA degree from Williams college in 1941, a MS degree from the Rensselaer Polytechnic Institute in 1948 and a PhD in 1950. He was senior chemist, manufacturing research, Congoleum Nairn Inc., 1941-44; analytical research chemist, assigned by U. S. Army to Manhatten project, Oak Ridge, Tenn. 1944-46; analytical chemist, General Electric corp., 1946; instructor in chemistry, Rensselaer Polytechnic Institute, 1946-48; research associate atomic energy contract, 1948-50; assistant professor, 1950; visiting senior physicist, Brookhaven National laboratory 1952; associate professor, Rensselaer Polytechnic Institute, 1954; professor of analytical chemistry, 1957. His field of research and technical work includes chemical analysis of uranium, thorium and rare earths, instrumental methods of analysis, infrared and mass spectroscopy. He is a member of ACS, Society of the Sigma Xi and Phi Lambda Upsilon.

A. P. Finkelstein obtained his BS and MS degrees in chemistry from the University of the State of New York College for Teachers at Albany, New York in 1955. For the last three years he has been working toward a PhD in physical chemistry at Rensselaer Polytechnic Institute under the supervision of Dr. Walter H. Bauer and Dr. Stephen E. Wiberley on the flow properties of model greases. This work has been partially supported by grants from the Esso Education Foundation. At present he is assistant professor of chemistry at the State College for Teachers at Albany.

D. O. Shuster is presently studying for a PhD in chemistry at Rensselaer Polytechnic Institute. He is investigating the capillary flow properties of soap-in-oil systems under the guidance of Dr. Walter H. Bauer and Dr. Stephen E. Wiberley with the partial support of a grant from the Socony Mobil Oil company, Inc., to the friction and lubrication program, research division, Rensselaer Polytechnic Institute. Mr. Shuster received a BS degree in education, with a major in chemistry, from the University of the State of New York college for Teachers, at Albany in 1954.

Eyring

Ree

Pressure and Temperature Effects On the Flow Properties Of Grease

By DR. H. EYRING, DR. A. T. REE, University of Utah

Dr. H. Eyring has been dean of graduate school, University of Utah since 1946. He is also associate editor of *Textile Research Journal.* From 1944 to 1946 he was research director of the Textile Foundation, worked with the Office Science Research & Development, U. S. Navy in 1944 and received the Alumni Achievement award from Arizona university in 1947. Dr. Eyring received the degree of BS and MS from Arizona university, PhD in chemistry from California, and Honorary Science degree from Utah in 1952, Northwestern, 1953 and Princeton in 1956. He is a member of the National Academy, Soc. Rheol., winning the Bingham medal 1949, Chem. Soc., winning the Nichols medal in 1951 and Philos. Soc. He has contributed previously to the NLGI Spokesman and to Institute Annual Meetings.

Dr. A. T. Ree has been a research professor in chemistry at the University of Utah since 1949. He received BS and ScD degrees in chemistry from Kyoto Imperial university, Japan in 1931. He became a professor of chemistry there following graduation and achieved professorship in 1943. In 1945 he was named dean and professor of the college of liberal arts and sciences at the Seoul National university, Korea, where he remained until taking his present position at the University of Utah. Dr. Ree has devoted his time to

the study of chemical kinetics, catalysis, reactivity of organic substances, rheology, and quantum chemistry. He is a previous contributor to the NLGI SPOKESMAN magazine.

Dreher

Criddle

Yield Points of Lubricating Greases

By J. L. DREHER, DR. D. W. CRIDDLE,
California Research Corporation

J. L. DREHER is a group supervisor of the grease research and development group of California Research corporation. He joined the company in 1945. Mr. Dreher obtained his AB degree in chemistry from the University of California in 1935 and began working for General Petroleum corporation. In 1943 he joined the metallurgical laboratories (Manhattan Project), Chicago university, and was then employed by Hanford Engineering works (a subsidiary of E. I. du Pont de Nemours) in 1944. Mr. Dreher is a member of ACS, ASLE and American Association for the Advancement of Science and has been a previous contributor to the NLGI SPOKESMAN magazine.

D. W. CRIDDLE graduated from Utah university in 1947 and served in the Navy during World War II in the field of applied electronics. He attended the University of California for graduate studies in physical chemistry and received his PhD in 1950. His thesis work and subsequent employment with California Research corporation have been in surface chemistry. His publications on gaseous adsorption, hydrocarbon chromatography, the physical properties of aqueous detergents, and the surface properties of lubricating oil additives indicate a wide and active interest in the field of surface chemistry. Recently he has been engaged in the study of fundamental of greases. Dr. Criddle has previously contributed both to the Institute Annual Meetings and to the NLGI SPOKESMAN.

Abstract

This paper points out that the yield point of a grease depends upon three variables: the rate of deformation, the type of deformation (compressive or shear), and the work-history of the grease. Field points were obtained by five different methods and are compared and discussed in terms of the above three variables.

Drout

Jenkins

Market Potential for Automotive Grease

By W. M. DROUT, JR., N. L. JENKINS, Esso Standard Oil Co.

W. M. DROUT, JR., following his graduation from Bucknell university in 1952 with a BS degree in chemistry, joined the Esso Standard Oil company. His Esso career was interrupted for two years during World War II for service in the U. S. Navy as an electronics warfare officer. Experience with Esso includes five years of technical and supervisory responsibilities in applied research, two and one-half years of supervisory and administrative responsibility in a petrochemical plant operation, and six years of technical and administrative responsibility in petroleum and petroleum specialty economics. Within this latter phase of his career he directed economic and technical studies to improve Esso grease plant operations. He is currently head of marketing economics which includes the directing of market potential studies. Mr. Drout holds six U. S. patents, is a member of several scientific and honorary societies, and is active in community affairs.

N. L. JENKINS was graduated from Yale university, class of 1951, and from Harvard graduate school of business administration in 1956. The interim period was served in the Navy as engineering officer aboard a destroyer, Atlantic and Mediterranean fleets. Coming to Esso Standard Oil company immediately following his graduation from Harvard, Mr. Jenkins was assigned to the economic and marketing research division. Much of his work has been in the development and analysis of market potentials and related subjects.

Abstract

The demand for automotive grease has always reflected the rapidly changing technology of the automotive industry. Changes in lubrication requirements were met and frequently anticipated with improved greases. Now, a new era in automotive technology has arrived. As we know, technological improvements in the past seven years have made it practical and attractive for the automobile manufacturers to reduce the number of grease fittings on new cars from 25 to 11. Furthermore, the manufacturers feel that the complete elimination of grease fittings is only a matter of time. The more optimistic feel that this will occur

within three years. The more conservative feel that it will occur within five years.

The effect of the reduction in grease fittings on new cars is diluted by the number of older cars on the road. Nevertheless if elimination of fittings on new cars is effected in the next five years, chassis grease consumption in 1965 will decrease 62 per cent from the 1957 level. The net effect of all other factors affecting grease consumption cannot overcome the handicap imposed by the large reduction chassis consumption. Even increased vehicle registration of 30 per cent by 1965 is offset by the reduction caused by the lengthening grease interval.

Doubling the time required to solve the technical problems connected with the elimination of fittings still results in a reduction in chassis grease consumption of 52 per cent. In either case, the reduction in chassis grease consumption is great enough to bring about a negative growth rate for automotive consumption for the next several years.

Van Gundy

Future Grease Requirements in the Steel and Underground Coal Mining Industries

By J. C. VAN GUNDY, The Texas Company

J. C. Van Gundy graduated from Rice Institute, Houston, Texas, in 1935 with a BS degree in chemical engineering. Upon graduation he was employed by the research and technical department of the Texas company and has been in the same department ever since. During his first eight years with the company he worked at both Port Arthur, Texas, and at the Texaco research center, Beacon, New York, doing research work primarily on waxes, aviation fuels and greases. In 1949 he was made staff engineer, technical service division, in New York City and spent most of his time working in the fields of hydraulics and greases. In 1951 he was transferred to Chicago and in 1955 to Pittsburgh, Pa., as a representative of the technical service division. His present assignment is confined to the basic metals industries, such as steel and aluminum and their captive allied interests, including coal mines. In this capacity he renders technical assistance, is responsible for the quality of lubricants sold and sees to it that his research division is fully advised of any future lubricant requirements. He is a member of ASLE, AISE and for a number of years was on the executive committee of the National Conference on Industrial Hydraulics. He holds one patent and has been the author of numerous articles on hydraulics and greases.

Abstract

Present and projected grease requirements up to 1975 are presented for both the steel and underground coal mining industries.

In the steel industry the consumption of greases is estimated to be 50 to 60 million pounds per year. Modest increases are forecast for the future. A rather broad breakdown by types is given, with predictions as to how each will change with respect to volume used and their properties.

With respect to the underground coal mining industry, some 25 million pounds are now required annually and this should reach 75 million pounds by 1975. Types of future lubricants supplied will be somewhat different than those normally used today, and this is discussed in some detail.

Mingledorff

Facts and Factors In Grease Manufacturing Costs

By M. S. MINGLEDORFF, International Lubricant Corp.

M. S. Mingledorff was graduated from Tulane university in 1927 with the degree of bachelor in business administration. After further study he then graduated from the Harvard business school in 1933 with a masters degree. Mr. Mingledorff at this time holds the position of treasurer of the International Lubricant corporation and is a recognized authority in determining cost factors in the manufacture of lubricants.

Abstract

This is an elementary discussion of many of the cost considerations that are brought to mind in reviewing the operation of a grease manufacturing plant. In scope, the paper treats of plant expenditures from the time the raw materials are received until the finished product is shipped. Cogent reasons are advanced as to why manufacturing costs should be better known and easily recognized.

Detailed accounting treatment of the subject is avoided and the theme endeavors to review the broad aspects of plant costs. In doing so, factors are mentioned which affect these costs both directly and indirectly. Touched upon rather briefly is the change

in making grease through the years and how these changes are reflected in grease prices. The importance of raw material as a cost element is brought out, and following this, the topic of labor expense and its relation to production is discussed.

The distinction is made between manufacturing *costs* and manufacturing *expenses*. In treating the latter, actual account names and descriptions are given with the idea of enabling the reader to become better acquainted with the composition of the accounts themselves.

The conclusion summarizes the importance of management action in using figures as a tool for control.

Leonard

How to Get the Motorist to Lubricate For Safety Every 1000 Miles—"From the Service Station Dealer's Standpoint"

By G. F. LEONARD, Pure Oil Dealer

G. F. Leonard became a service station attendant for the Keystone Oil company of Chicago in 1930. In 1931 the Keystone Oil company was taken over by the Pure Oil Products company, where he was reassigned as a sales promotion man, opening new company outlets in the Chicago area. During the World's Fair in Chicago he managed the Edgewater Beach Pure Oil station and parking lot across the street from the Edgewater Beach hotel. In 1934 he opened the new Pure Oil station at 692 Central avenue in Highland Park as a lessee dealer, and is currently operating in a recently remodelled station at this same location. Mr. Leonard is one of the very highly regarded business men in Highland Park and is considered as one of the most successful Pure Oil dealers in the company.

Abstract

Most people today are too busy to pay attention to the maintenance of their cars. Automobiles are so essential to every day living that people find it hard to do without the car in order to have it serviced, and do not realize how fast 1,000 miles accumulate on their speedometer.

With today's high speed living and driving it is essential that a car be lubricated every 1,000 miles in order to insure safety. For a dealer to develop a successful lubrication business he must get this message to his customers. Today a great many women are in charge of having the car serviced so that the safety factor can be used to impress them of this need.

The average customer will stop at a service station six times each month. This gives the dealer six golden opportunities to observe the needs of his customer and to sell safety lubrication. By taking advantage of these opportunities motorists can be sold on 1,000 mile lubrication and *safety* is the key word.

Borski

How to Get the Motorist to Lubricate for Safety Every 100 Miles—"From the Car Dealer's Viewpoint"

By M. M. BORSKI, C. B. O'Malley, Inc.

M. M. Borski started out in the automobile business as a service station attendant. Later he became a lubrication man for a new car dealer and worked his way up to mechanic, shop foreman, assistant service manager and finally service manager. During the period 1956 to 1958 he was employed by the Oldsmobile division of General Motors as a Service representative in the Chicago metropolitan area. Mr. Borski is married and has one child and has served three years in the U. S. Army. He currently holds a position as service manager for C. B. O'Malley, Inc., one of Chicago's leading Oldsmobile dealers.

Abstract

Manufacturers' recommendations for lubrication every 1,000 miles are probably one of the strongest points for selling lubrication to *new* car owners. However, all our owners are not new car buyers. So we must use many other means of selling this type of service.

A good follow-up system that reminds the owner just when his next lubrication is due, and again if he is past due, is another great help for selling lubrication.

A good steady lubrication business is very necessary to the profitable operation of a dealership, or independent garage, etc. In order to maintain this, constant selling on the service floor is required. Service salesmen realize that a car on the lube rack is an open door to other service sales, hence this is the service that must be constantly sold.

Impressing the owner with the job he receives is probably the easiest and most effective of all sales tools for this type of work. The lube racks should be in an area that is convenient for the owner to see what is actually done *for* him. Let him see that a quality lubrication is more than just a grease job. Impress him with the fact that it is also a safety inspection

and that anything that is wrong with his unit can be discovered by this periodic inspection and can save him time, money and inconvenience.

Horwath

Current and Future Military Grease Requirements

By R. J. HORWATH, Military Petroleum Supply Agency

R. J. HORWATH attended Purdue university. He has been in the petroleum business for 25 years. For nine years he worked in the research laboratory of the M. W. Kellog company as project supervisor. For eleven years he held the position of field petroleum inspector on the eastern seaboard for the Department of the Air Force. The balance of this period has been with the Armed Services Petroleum Purchasing agency and its successor, the Military Petroleum Supply agency. Mr. Horwath is currently head of the technical data branch, technical division of the latter agency.

Abstract

This paper presents the statistical data for the various greases purchased by the Military Petroleum Supply agency for the military departments. Included is the overall volume and dollar value of greases versus the total volume and dollar value of all petroleum and related products procured during the fiscal years of 1957 and 1958 as well as data relative to small business participation in these procurement programs. Detailed for these two years are the volume and dollar value of the individual grease specifications, both synthetic and petroleum base. The composition and equipment application of these greases is presented. A prediction of future procurement of the more common use greases is also made.

Waite

Two Tons Of Grease

By J. W. WAITE, Inland Steel Co.

J. W. WAITE is lubrication engineer with Inland Steel company. A machinist by trade; a registered mechanical engineer by profession, he has had a wide variety of experience with Inland over the past nineteen years including machine tool operation, diesel maintenance, construction work and mechanical maintenance supervision in the tin mill. He was graduated from Rose Polytechnic institute with a BS degree in mechanical engineering in 1950 and was registered as professional engineer in the state of Indiana in 1957. With his employment as lubrication engineer in 1957, he became a member of ASLE and has been active in that organization.

Abstract

An expanding economy has demanded machines of increasing size and complexity. To insure uninterrupted performance of this equipment, extensive automatic lubrication equipment has been installed. Increases speeds, temperatures and bearing loads have placed more exacting demands on the lubricants.

Any device or technique that will improve lubrication practice, streamline handling methods, or reduce operating costs merits investigation. One possible way of accomplishing these three objectives is by the installation of a system for bulk handling of grease. However, there are certain disadvantages of such a system, namely; the initial cost of equipment and installation are high, additional cost is incurred in transporting the empty container and a greater degree of co-ordination between supplier and consumer is required.

A study of bulk handling methods resulted in the design and installation of this equipment in a blooming mill facility. As no suitable container was available for transporting and storing large quantities of grease, one was designed and fabricated.

The design of a container of sufficient size to hold two tons of grease that will also serve as a reservoir for a grease system requires careful consideration. The paper covers the important features of the design of the container and is illustrated with drawings.

Birkett

The Mechanisms of Dispersion

By D. H. BIRKETT, Battenfeld Grease & Oil Corp., Inc.

K. H. BIRKETT was graduated from the University of Missouri in 1949 with a BS in chemistry and has done graduate work at the University of Kansas City. Since 1956 Mr. Birkett has been in the research department of the Battenfeld Grease and Oil corporation of Kansas City. Prior to that he spent four years with Midwest Research Institute in Kansas City. His work has consisted of formulation and testing of diverse products, chemical consulting, manufacture and application of lubricating greases, and technical writing.

Abstract

The distribution and form of particles of thickener affect the appearance and performance of lubricating grease. In order to prepare outstanding products it is necessary to use both thermal and mechanical processes to disperse certain thickeners.

The particles, which are the distinctive units of colloids are not, in general, single molecules, but commonly each consists of a large number of molecules. They may be wholly separate from each other and, therefore, independent; or more usually they may be grouped to form still larger structures. In all cases, the material with these groupings acquires new and characteristic properties.

The optimum form of fibers in a lubricating grease will depend upon the composition of the soap, the particular oil employed and on the processing techniques. After first obtaining the proper crystal size by thermal means, the use of mechanical dispersing equipment will often provide lubricating greases with increased yields, better appearance and better pumpability characteristics.

It may be that in mechanical dispersing certain electrical charges are placed on the particles that would tend to affect their distribution. Unmilled agglomerates may be electrically neutral but by being stroked against one another in milling a charge may be placed on them. This would provide better stability of the product.

Dickason

Some Practical Benefits Of Mechanical Dispersion

By J. J. DICKASON, Jesco Lubricants Company

J. J. DICKASON has been associated with Jesco Lubricants company since February, 1941, starting as a chemist and serving as chief chemist since 1945. During this time his work has consisted of developing and evaluating new products, technical sales service and conducting training courses for sales trainees. In February of this year he was elected vice president of research and development. A graduate of the University of Kansas in 1940 with a Bachelor degree, he has been active in and has held committee appointments in ACS and ASTM. He is presently chairman of the Technical Subcommittee on NLGI Classification of Lubricating Greases.

Abstract

Through the use of mechanical dispersing equipment in his processing line, a lubricating grease manufacturer may expect to derive eleven benefits.

1. Improved appearance by the elimination of uncombined soap particles or in the case of filler type products, the reduction to their smallest particle size of all solid additives.
2. Increased yield achieved by the better utilization of the thickening agent, be it a conventional soap base or an inorganic thickening agent.
3. Increased production accomplished by the production of more product from the same soap charge.
4. Reliability of quick-cooled penetration tests made while the product is still in the processing kettle.
5. Improved shear stability as shown by penetrations obtained on samples worked 10,000 double strokes.
6. Uniformity of product from batch to batch.
7. Improved storage stability based on penetrations obtained on retained samples.
8. Decreased leakage tendencies as demonstrated by a modified Wheel Bearing Performance Test procedure.
9. Improved pumpability.
10. Improved anti-bleed characteristics.
11. Utilization of inorganic thickening agents.

While the benefits are many, the finished product, even though mechanically dispersed, can be no better than the raw materials used in its composition nor the processing the product received prior to its being mechanically dispersed.

Scientific Detection in Grease Lubricating Problems

By R. J. RONAN, M. C. McLAREN, The Texas Co.

I. J. RONAN attended St. Patricks Academy, St. Francis Prep., Pratt Institute and in 1939 received his

BS in chemistry from Polytechnic Institute of Brooklyn. From 1930 to 1933 he was employed by the Texas company as a messenger-clerk. From 1933 to 1939 he worked as a dyestuff chemist for Dye Specialties. Since 1939 Mr. Ronan has been employed by The Texas company. He was an analytical chemist from 1939 to 1940 in Beacon, N. Y. In 1940 he went to the standardization department in Beacon where he stayed till 1942. He transferred to New York in 1942 and worked in technical services until 1952. From 1952 to 1956 he was supervisor in the field services department. He is now regional manager of technical services. Mr. Ronan is a member of Phi Lambda Epsilon and the Texaco Research club.


Ronan


McLaren

M. C. McLaren attended Ashtabula Harbor school and in 1928 obtained his AB degree with a major in chemistry from Oberlin college. From 1928 to 1943 he was employed by the lubricating oil research & processing groups of the Texas Company at Port Arthur. Since 1943 he has been working in the products application and field service departments of the Texas research center at Beacon, New York. Mr. McLaren is a member of the Texaco Research club.

Abstract

The writers discuss the development of the "technical service man" for grease lubrication and show how this development has assisted machinery designers and lubricating grease users. A number of modern analytical devices are described briefly and their use in the solution of practical problems is discussed.


Kline

A Preformed Organic Thickener

By J. E. KLINE, Amoco Chemicals, W. L. HAYNE, JR., T. P. TRAISE, Standard Oil Company (Indiana).

J. E. Kline received his BS degree in mechanical engineering from Wayne university in 1936 and the degree of MS in mechanical engineering from the University of Michigan in 1937. After completing his graduate studies, Mr. Kline was employed for several years in the research department of Standard Oil company (Indiana). In 1945 he joined the company's sales technical service department where later he became division director, Stan-Add additive division. He was transferred to Amoco Chemicals corporation when this wholly owned subsidiary was formed in January, 1957. At that time he assumed his present position in Amoco's Marketing department as manager, petroleum additives.

W. L. Hayne, jr. received his BS degree in chemical engineering from the University of Louisville in 1947 and an MS degree in chemical engineering at the same time. Hayne had interrupted his work at the university to serve with the U. S. Navy as an officer aboard a submarine from 1943 to 1946. He joined the research department of Standard Oil company (Indiana) in January, 1948, where he is presently employed. Mr. Hayne is a member of Sigma Tau, Theta Chi Delta, AIChE and ASLE.

T. P. Traise received his BA degree in chemistry from Blackburn college in 1950 and his MS in chemistry from De Paul university in 1955. He was employed as a chemist in the research department of Victor Chemical works from 1950 to 1956 as a chemist in their grease research and development group. Traise is a member of ACS and ASLE.


Dimick

Application of Gas Chromatography In the Manufacture Of Grease

By DR. K. P. DIMICK, G. W. COLLINS, Wilkens Instrument & Research, Inc., DR. W. A. LINK, Archer-Daniels-Midland.

K. P. Dimick obtained his BA degree in chemistry from San Jose college. Graduate work which culminated in an MA and PhD was taken at Oregon State college, Corvallis, Oregon. Major studies included organic and physical chemistry and chemical engineer-

ing. Beginning in 1942 Dr. Dimick was employed for fourteen years with the Department of Agriculture at the Western Regional Research Laboratory. Dr. Dimick is now director of research for Wilkens Instrument & Research, Inc., Walnut Creek, California. This company has specialized in gas chromatography instrument development and in fundamental applications in research. He is a member of Phi Lambda Upsilon, Sigma Xi, American Chemical Society, American Oil Chemists Society and Instruments Society of America. His publications and patents cover a wide range of endeavors.

Abstract

One of the most useful applications of gas chromatography has been in the field of fat and fatty acid analysis. In usually less than 30 minutes a complete picture of the methyl ester composition of a fat ranging from C_8 to C_{20} carbon atoms can be obtained. The right column choice will reveal the odd number of carbon atoms, branched chain, and unsaturates as well.

In grease manufacture, the fatty acid composition of the glyceride, esterfied fatty acid, or soap can be of utmost importance in the performance of the final product. General chemical analysis of these components usually include saponification number, liter, iodine value and weight.

Analytical methods for the separation of soaps, and fat have been worked out to give good recoveries.[1] Conversion of the fat to methyl esters is quantitative by trans-methylation in alkaline or acid methanol. The methyl esters extracted with pentane are introduced to the gas chromatograph which automatically separates and records the amount of each acid methyl ester. Soaps can be quantitatively converted to the methyl ester by diazo-methane and similarly analyzed.

Peak areas have been found to be proportional to the weight per cent of the ester component.[2]

1. George W. Powers and Frank J. Piehl, "Rapid Chromatographic Analysis of Soap-Thickened Lubricating Greases" *Anal. Chem. 30* 28 (1958).

2. Keene P. Dimick, "The Quantitative Analysis of Fatty Acid Methyl Esters by Gas Chromatography," presented at the 31st fall meeting AOCS, in Cincinnati, Oct. 1, 1957.

Smith

Development of Extreme Pressure Greases

By R. K. SMITH, E. F. Houghton & Co.

R. K. SMITH received his BS degree from Pennsylvania State college in 1940. He received a PhD in physical chemistry in 1944 from Princeton university. He was associated with Standard Oil Development company from 1943 to 1947. During this period he was associated with Standard Oil Development company from 1943 to 1947. During this period he was active in spectroscopic investigations, and reactions of hydrocarbons in alkylation, isomerization and polymerization systems. In 1947 he joined Kendall Refining company as group leader in lubrication and chemical research. During this time he was active in development of new motor oils, gear lubricants and greases for automotive and specialty operations. In 1953 he became associated with Houdry Process corporation as chief of the exploratory research section. This work included the development of new refinery processes for production of gasoline from residual stocks as well as the application of catatlysis to fine chemical manufacture. In 1956 Dr. Smith became associated with E. F. Houghton & Company as manager of research.

Abstract

Operation advances and aviation technology have created a need for high quality extreme pressure greases which are capable of operation for extended periods of time at temperatures ranging between 65°F and 400°F. The greases required with these characteristics will be used in lubrication of mechanical components of the aircraft which are subjected to extreme loads, such as screw-jack actuators and spherical bearings subject to oscillatory motion. A review of the current technology concerning extreme pressure and high temperature greases has been made. Following this review, a basic grease composition was selected for treatment with known extreme pressure additives. These additives include conventional sulfur based additives, chlorine based additives, combinations of the above and additives based on phosphorus. Preliminary investigations revealed deficiencies in these available additive systems. A series of additives were subsequently prepared, which overcame the disadvantages of known extreme pressure additives. Resistance to corrosion and decomposition at high temperatures was a major factor in the selection of the final additive system. Numerous greases with Mean Hertz Loads of fifty or greater have been produced, using various members of this additive system. Various homologous series can be shown to have unexpectedly beneficial results in comparison with other members of this series. The final grease which has developed during the course of this project is a blend of silicone fluids, a polyester fluid and an aryl substituted urea used as a thickener. This grease has been evaluated at temperatures as high as 400° F with no loss in extreme pressure characteristics. It is also known to be suitable for operation at temperatures as low as −90° F.

Question and Answer Session

Symposium on Fundamental Research Aspects of Bleeding of Lubricating Greases

EDITOR'S NOTE—The NLGI panel discussion on fundamental and practical aspects of breeding of lubricating greases, presented at the 1957 Annual Meeting in Chicago, resulted in a lively question and answer session conducted by panel chairman J. L. Dreher. Reproduced here is a transcript from the meeting. This article concludes the NLGI SPOKESMAN 1957 series on bleeding of lubricating greases—our thanks to the following for their participation:

Panel Chairman
Mr. J. L. Dreher
California Research Corp.
Richmond, Calif.

Mr. Harry Worth
Union Oil Company
Brea, Calif.

Dr. D. W. Criddle
California Research Corp.
Richmond, Calif,

Dr. R. H. Leet
Standard Oil Co. (Indiana)
Whiting, Indiana

Mr. S. F. Calhoun
Rock Island Arsenal Lab.
Rock Island, Ill.

Dr. J. J. Kolfenbach
Esso Research & Engineering Co.
Linden, N. J.

Mr. A. E. Baker, Jr.
General Electric Co.
Lynn, Mass.

Mr. R. S. Barnett
The Texas Company
New York, N. Y.

Mr. J. S. Aarons
National Tube Research Lab.
Pittsburgh, Pa.

Mr. F. R. Hart
Standard Oil Co. of California
San Francisco, Calif.

Presented at the NLGI 25th annual meeting in Chicago, October, 1957

Q. WORTH:

The two causes of bleeding generally proposed are: (1) Separation of oil from the thickener by forces, such as hydrostatic head, added weights, air pressure, or centrifugal force. (2) Extrusion of oil due to a tendency of the thickener network to shrink. Which of these two causes do you think is the more important?

A. CRIDDLE:

I think that both causes are operative, but the first is more important. The gel structure tends to creep and coalesce in order to minimize its surface area, but it is difficult to isolate this effect from the hydrostatic or other forces which cause contraction of the gel structure. My opinion is that the hydrostatic or added forces play the predominant role, and there is an unknown contribution from the natural tendency of the structure to collapse.

Question and Answer Session

COMMENTS, LEET:

Len said that he wanted something controversial. I'm willing to take the other side for sake of argument. There might be an alternate explanation to the data presented by Dean Criddle. I would like to discuss his summary of data relating to tensive and compressive forces (Figure 9 of text).

I do not intend to question the data, only the interpretation. The words compressive and tensive are used to express the direction of the application of the force. Dean stated that when the grease is held in a vacuum the leakage is reduced. This suggests that the coefficient of volume expansion of the thickener is greater than the oil. The cause of this is hard to understand. Now I'd like to consider each of the experiments on the slide (Figure 9). In the first one (9a) the grease is placed in a cone supported by a metal screen. I suggest that the extremely small opening at the crossing of the wires in the screen could form a competing capillary system that leads oil away from the grease. In the tensive case the grease is hanging from a horizontal plate, and no competing capillary space is in contact with the grease.

In system 9b the same interpretation might apply. Again the grease that leaks the most contacts the screen in his compressive case. The tensive case has no competing capillary forces.

Figure 9c is tougher to explain. The results may depend on the number of wire crossings that are in contact with unit amount of grease. It appears from the diagram that this is the best evidence for the compressive-tensive suggestion.

Figure 9d can be explained by the same assumption made for 9a and 9b.

Mr. Calhoun also cited some evidence that appears to be contrary to the tensive-compressive theory. He showed that when the thickness of grease was increased in his pressure test the leakage decreased.

The logical extension of the argument is to suggest that to inhibit grease bleeding you should place the grease under tension. Might I cite a centrifuge test as an example of increasing tensive force on the grease. If the grease was suspended on a screen in a centrifuge tube and a small tensive force exerted, the leakage should be reduced according to your theory.

I would like to hear Dean's comments on these negative remarks.

COMMENTS, CRIDDLE:

The effects of pressure and vacuum on bleeding are explained as follows for grease on a filter. A positive pressure on the grease increases the bleeding rate, but as the pressure is reduced the bleeding rate decreases. A vacuum on the grease side is equivalent to a further reduction of pressure, and such a vacuum also reduces the bleeding; the vacuum puts a "negative pressure" or a tensive stress on the grease. On the other hand, if the vacuum is on the filter side, the bleeding rate is increased because the atmosphere now exerts a pressure.

Dick suggested that differences in the compressibilities of oil and thickener may account for the effects of vacuum on bleeding rate. But does a vacuum permit the gel structure to increase perceptibly in volume with respect to the oil? Compressibility data are not available for the wide variety of thickener systems in our paper. However, we feel that differences in compressibility are not the answer for the following two reasons. First, liquids are generally more compressible than solids; on this basis we expect that with the application of a vacuum the oil would increase more in volume than would the thickener, although the converse is required for compressibility effects to explain our data. Secondly, compressibility effects for a pressure change of one atmosphere (a perfect vacuum) would explain at best only the order of 0.01 per cent change in volume of the oil; whereas, the amount of oil involved in our bleeding experiments was about 1 per cent. Thus, both the sign and magnitude of the volume changes lead us to to exclude compressibility effects as explanations for our data.

Dick suggested that capillary forces may be an alternate explanation of our data. However, it is difficult to see how this could be so. For example, bleeding occurs with grease in a screen cone with apex down (Figure 9a, left); but no bleeding occurs when the apex is up. In this experiment the same area of the screen is available to compete with the gel for the oil.

In our experiments with grease in screen cones, the grease was pressed into the cone. The grease extruded through the mesh was wiped off to leave a smooth cone-shaped surface. This process leaves the wire screen initially covered with a grease-and-oil film. Hence, even at the beginning of the test there is no clean metal surface to be wet and to compete with the thickener for oil.

In Mr. Calhoun's experiments for constant size filters in which the leakage decreased as the height of the grease sample increased, we feel that there are two causes: (1) a filter cake of thickener builds up from thick samples and (2) thick samples have a smaller bleeding area per unit volume of grease than thin samples. Hence, Mr. Calhoun's data do not provide a test of the effect of tension on bleeding.

Our experiments with grease cylinders of constant length but differing diameters (Figure 9d) used the same screen area per volume of grease. Thus, the "capillary effects," if any would be constant in these cases. We feel that the alternate explanation of "capillary forces" is not satisfactory.

COMMENTS, LEET:

I would like to add one brief remark. The problem that bothers me most is the physical mechanism of leakage. Possibly our knowledge is improved by labeling the direction of force application but what happens to the system? This is the problem that makes the search for alternative explanations for the mechanism of leakage in the systems cited.

Q. CRIDDLE:

In view of the importance of tensive stresses on the bleeding rate of greases in narrow cylinders, do you feel that your "test tube bleeding test" is predominantly a test of bleeding under tensive stress conditions?

A. CALHOUN:

Whether or not the "test tube bleeding test" is a test of bleeding under tensive stresses would depend upon the consistency of the grease and the size of the tube. A stiff grease might be suspended from the sides of the tube and thus depend almost wholly upon the screen for support. This would impose compressive stresses upon part or all of the grease depending upon its consistency. A wide tube and a soft grease would result in predominantly compressive forces, while a small tube and a stiff grease would result in mostly tensive stresses. In the case of the test as used at Rock Island Arsenal, it would be impossible to say how much was due to tensive and how much to compressive forces. No doubt both were in existence.

Q. KOLFENBACH:

Mr. Baker, you have assumed that oil bleeding is responsible for lubrication. In sealed bearings, grease moves as an entity. Bleeding should not be a factor. Are your data based on open bearings, and shouldn't the conclusions be restricted to open bearings?

A. BAKER:

I think you have a good point, John, one that requires more time for discussion than we have available; and I would like to discuss the wider implications involved in your comments after the meeting. But to answer your specific questions, the functional grease life data used for the correlation with static grease bleeding results was obtained mainly on 306 open bearings operating at 3600 rpm with the bearing caps two-thirds full of grease. However, in relating grease bleeding and speed factor (DN), 17 mm and 35 mm open bearings were used. In view of the fact that the analysis and subsequent correlations I have shown involve only open bearing test results, I will tacitly agree to restrict the conclusions to such bearings. However, I do not limit the ideas expressed for I think that similar and equally valid relations can be shown for sealed bearing grease results and bleeding.

Q. BARNETT:

Mr. Baker, what were the loads used in the bearing tests described?

A. BAKER:

The bearings were operated with a 160 lb. radial load and a 40 lb. axial load.

Q. HART:

Is separated oil on the surface of a container of grease an indication that the quality of the grease is poor?

A. DREHER:

No, not necessarily. All lubricating greases will bleed, dependent upon the storage conditions. Many experts consider grease to be a reservoir of oil held by a network of thickener particles. The oil is supposed to exude slowly from the network at a rate sufficient to lubricate the bearings properly.

Care should be taken in relating bleeding in storage to bleeding in service. With high quality greases, depressions in the surface can be expected to contain small pools of separated oil after a week or more of normal storage. If the depressions become filled within a day or so, one might expect to encounter excessive bleeding in service.

It should be emphasized that, for greases in containers, depressions are necessary for bleeding to occur. Greases which tend to bleed excessively will not have any separated oil if the surface is level and contains no depressions. The latter statement does not hold for all semifluid greases. With some semifluid greases, the thickener concentration is so low that it will separate from the oil by settling towards the bottom of the container.

Q. HART:

What should a customer do when he finds separated oil on the surface of a grease, and what should a customer do to minimize oil separation?

A. DREHER:

The customer should be advised to pour off the oil and gently stir the top few inches of grease to work in the remaining oil. The grease can then be used in

the normal manner. Usually the separated oil represents only a small fraction of the grease. By discarding it, the customer will not significantly affect the consistency or lubrication properties of the grease.

The customer should leave the surface of the grease smooth and level after removing grease from a container. This will minimize bleeding.

Q. Dreher:

Will you please discuss the problem of excessive oil separation resulting in plugged lines due to deposits of hard cakes of thickener concentrate that sometimes occur in grease dispensing systems?

A. Aarons:

The problem of oil separation due to elevated temperatures has been discussed both in the laboratory evaluation and actual field experience categories. Protective wrappings of steam lines within close proximity of grease dispensing systems is a positive cure for this condition. With the very small bearing and valve clearances found in grease pumping systems, it becomes necessary to watch very closely the pressures developed, and over lengthy periods of pumping time even the most stable grease could leave hard deposits of thickener. In addition to very small bearing clearances, the possibility of filter development due to slight cracks in the line or loose threading of pipe could lead to loss of oil from a grease under pressure. In order to minimize these conditions, the following measures should be adopted:

1. Careful maintenance of all dispensing lines.
2. Use of lowest possible pressure when pumping.
3. Relieving the pressure on the grease wherever possible.
4. Use greases which show little tendency to bleed under dynamic conditions.

About the Author

J. L. Dreher *is group supervisor of the grease research and development laboratory of California Research corporation. He joined the company in 1945. Dreher obtained his AB degree in chemistry from the University of California in 1935 and began working for General Petroleum corporation. In 1943 he joined the Metallurgical Laboratories (Manhattan Project), Chicago University, and was then employed by Hanford engineering works (a subsidiary of E. I. Du Pont) in 1944. Dreher is a member of ACS, ASLE, and American Association for the Advancement of Science.*

SUMMARY OF RESEARCH BY ASTM TECHNICAL COMMITTEE G-IV ON BLEEDING OF LUBRICATING GREASES

Summary of Chairman B. B. Farrington's Report To ASTM Technical Committee G At Atlantic City Meeting in June 1957

Presented at the NLGI 25th annual meeting in Chicago, October, 1957

SECTION IV ON LUBRICATING grease research techniques of Technical Committee G, ASTM committee D 2, undertook in 1953 a study of the separation of oil from lubricating grease. Included in the study were factors affecting bleeding, bulk storage tests, and a selected number of accelerated laboratory tests. The work of the committee is nearly complete, and a final report is being prepared. A sum-

mary of the committee's work was presented by chairman B. B. Farrington at the June 1957 meeting of ASTM in Atlantic City.

Variables and Mechanism of Bleeding

1. *Pressure*—Pressure was applied to samples of grease in filter-type apparatus by pressurized air, centrifugal force, and weights. In all cases, as known for more than 20 years, pressure accelerated bleeding. The quantitative relation between pressure and bleeding rate was found to depend upon the test and the magnitude of the applied pressure. As a general rule, the bleeding rate was proportional to the square root of the pressure.

2. *Tension*—Tension was found to reduce bleeding. If tension is sufficiently great, bleeding stops. Mr. Farrington likened a grease sample to a saturated sponge with fine pores. If pressure is applied, liquid is forced from the sponge. If the sponge is placed under tension, the structure tends to expand, holding the liquid in.

3. *Temperature*—The effect of temperature was studied over a moderate range near room temperature. The bleeding rate was found to increase as the temperature increased. The three committee greases used in the study were quite sensitive to temperature variations; increasing the temperature from 77F to 100F nearly doubled the bleeding rate.

4. *Vibration*—The results of the study on vibration in large-scale tests did not agree with those obtained in small-scale tests. It appears that further work is needed to establish the effect of vibration on bleeding.

5. *Working*—Limited data indicate that working affects the bleeding tendencies of some greases, but not others.

6. *Oil Migration*—Migration studies were performed with a transparent, rectangular cell filled with undyed grease in the center of which a vertical layer of dyed grease was carefully placed. The cell, tilted at a 45° angle, was stored for several weeks at 100°F. Above the level of the lowest point of the exposed surface of the grease, a slight downward migration of the oil was observed. Below that level, there was essentially no movement of the oil.

In the past, the development of laboratory bleeding tests has been handicapped by the lack of reliable data on the bleeding tendencies of greases in field storage. To correct this, the committee investigated bulk storage tests, for which they selected 35-pound pails of grease.

1. *Cratered Pail Test*—On the basis of the results of their study, this test was selected as the standard for evaluation of bleeding in bulk storage. In the test, three conical craters, supported by wire screen cones, are uniformly spaced in the surface of the grease. The volume of the separated oil is calculated from the dimensions of the cone and the diameter of the oil pool in the crater. The test is relatively simple and has a fair degree of reproducibility.

Variables in crater-type tests were studied. The following conclusions were drawn from the results of the study:

a. Oil separation is directly related to cone area.
b. Within the limits of the test, grease volume has little effect on the amount of oil separated.
c. Removal of oil during test gave erratic results.
d. Cold-packed grease bled more than samples packed immediately after manufacture.

2. *Tilted Pail Test*—In this test, the pail of grease was stored at a 45 degree angle. The results correlated fairly well with those obtained in the cratered pail test. The principal objection to the test was the tendency of soft greases to slump in the tilted pail.

Laboratory Tests

Eight laboratory tests were studied. The bleeding rate was accelerated in the tests by increasing either the temperature or the pressure. Weights, air (or nitrogen) pressure, and centrifugal force were used to increase the pressure. With the three committee greases, the Union Oil three-ounce crater test and the Federal test method 322-T were found to correlate best with the cratered pail test.

Conclusions

Mr. Farrington drew the following conclusions from the work of the committee:

1. The importance of compressive and tensive forces in oil separation from greases is established.
2. In accelerated laboratory tests, pressure and temperature should not deviate markedly from those encountered in bulk storage. It appears that the pressure should not exceed one psi, and the temperature should be below 130F.
3. The cratered pail test is accepted as a reliable means of evaluating the bleeding properties of greases in storage.
4. The three-ounce crater test and the Federal test method 322-T were shown to correlate well with the cratered pail test on the three committee greases.

Recommendations

He made the following recommendations:

1. Determine the repeatability and the reproducibility of the three-ounce crater test and the Federal test method 322-T on a variety of greases covering a wide range of consistencies.
2. Develop an improved laboratory test which uses less time than the three-ounce crater test and a smaller sample than the Federal test method.

Field Testing Of Automotive Chassis Greases

By C. L. Knapp and
J. Panzer

Esso Research and
Engineering Company

THE DEVELOPMENT OF improved greases for automotive chassis lubrication requires tests which will give an accurate measure of performance. Several laboratory tests that have been devised to simulate the behavior of kingpins[1] and ball joints[2] are useful in this respect, but their value is limited since field correlations are not yet available. For this reason, field tests must be used to get a reliable evaluation of the quality of a new grease.

A suitable field test procedure must directly measure the performance of a grease under realistic conditions in a vehicle. In the past, the field testing of chassis greases has been largely based upon the reactions of experienced drivers.[3] In recent work at Esso Research, we have made progress in establishing field test procedures based on instrumental techniques. The quantitative data obtained by these techniques can complement the reactions of test car drivers and can serve as a basis for evaluating laboratory tests.

As a part of this program, a new field test procedure has been used to evaluate lubricants in the front suspension ball joints in cars. These joints have been somewhat difficult to lubricate satisfactorily. Two aspects of grease lubrication of these joints are important: protecting the ball joint from wear, and maintaining low friction to give low steering effort. Both of these factors were measured quantitatively in our field test procedure, to provide an accurate measure of automotive grease performance in this application.

Plan of the Test

In a typical application of this technique, three automotive multipurpose greases were evaluated (designated as greases A, B, and C in the following discussion; grease B differs from grease A only in containing 3 per cent of "fine" grade molybdenum disulfide; grease C has a different soap system). A group of fourteen 1957 passenger cars of four makes was used, comprising vehicles in the low, medium and high price ranges. Operation of the vehicles averaged 16,000 miles during the test. Each car followed a fixed driving schedule over public roads, at speeds typical of mixed city and country driving.

In order to obtain direct comparisons under identical conditions, two greases were used in each car, one on each side. The greases were distributed through the fourteen cars in all possible combinations so that a statistical analysis of the results would be possible. Lubrication periods covered the ranges recommended by automotive manufacturers and by lubricant suppliers. The distribution of the greases among the cars is shown in Table I.

Before the test was initiated, new front suspension ball joints were measured and installed in each car so that wear measurements could be obtained. Greasing was performed in the conventional manner, using a hand grease gun. Each car was lifted in such a way

FIGURE 1, steering wheel used for torque measurements

FIGURE 2, measurement of steering torque

that its weight was off the ball joints; this allowed the grease to flow into the joints.

Steering effort was measured in each vehicle just before relubrication on at least three different occasions. Wear of the ball joints was measured at the end of the test.

TABLE I

Distribution of Test Greases

Vehicle	*Position of Greases in Cars*							
Make:	W		X		Y		Z	
Side:	*Left*	*Right*	*Left*	*Right*	*Left*	*Right*	*Left*	*Right*
	A	B	B	C	C	A	A	B
	A	C	C	A	A	B	A	C
	C	B	A	B	A	C		
	B	A	C	B	B	C		

Steering Effort Measurements

Steering effort was measured with a special steering wheel equipped for torque measurements, based on a design by the Engineering Staff of the Ford Motor Company.[4] This instrumented wheel, containing a four-arm strain gage, was clamped onto the steering wheel of the car being tested. As the wheel was turned, the steering torque, as measured by the strain gage, was continuously recorded. To eliminate the effects of random variables, such as road and weather conditions and different techniques of cornering, the torque measurements were made while the car was stationary. The front wheels of the car were set on a pair of turntables of the type used in front-end alignment, thus allowing the wheels to turn as freely as when the car was in motion. This technique also permitted precise control over the angle of turning, as is required in view of the increased torque at higher turn angles Photographs of the equipment used are given in Figures 1 and 2.

During measurements of the steering torque, an observer sat behind the steering wheel and turned it five times to the left through an angle of 15° and then five times to the right through an angle of 15° (angle checked by another observer). By keeping the rate of turning slow, its effect upon torque was kept negligible. The torque measurement was performed on at least three different occasions during the test, immediately before a scheduled relubrication. The torque data obtained in this way reflected the performance of the grease in each car.

The data were subjected to a statistical analysis of variance. Since each car had two greases, simultaneous equations containing two variables were set up to obtain the effect of individual greases. For example, equations such as the following were used:

$$\Sigma(A + B) = L$$
$$\Sigma(A + C) = M$$
$$\Sigma(B + C) = N$$

Here A, B, and C represented steering torque measurements corresponding to the three greases evaluated. The quantities L, M, and N were the sums of the steering torques from all cars containing the designated pairs of greases. After obtaining the torque sums for each pair of greases, the contribution of each grease to each torque sum was obtained by solving the equations.

A high quality grease should give low steering effort (torque) and maintain that low effort over a long period of time. The analysis of the torque measurements showed that both differences among greases and differences in car makes affected the torque significantly, as shown in Table II. Grease C showed the lowest average torque in each group of cars, while grease A had the highest. These differences were particularly noticeable among cars of make Y and would be easily detectable to the average motorist.

TABLE II

Overall Rating of Greases

Grease	*Vehicle Make**	*Relative Steering Torque Inch Lbs.†* W	X	Y
A		82.6	81.6	54.1
B		71.4	78.8	39.1
C		70.0	75.6	36.8

Conclusion: Grease C best in reducing steering effort. (Relative steering effort: C<B<A.) Statistical confidence level of conclusion: 94 per cent.

*Cars of make Z could not be included in the statistical analysis of steering torque, since only two cars of make Z were included in the test. This occurred because the test was designed partly for other purposes.

†Numbers represent average torque for four cars with each grease, observed just before relubrication.

In addition to determining the effects of greases and vehicles on steering effort (and also wear) it would have been of interest to study the effect of varying the mileage between relubrication periods. However, it was not possible in this test to control these periods sufficiently, because compromises had to be made in scheduling mileage accumulation, incidental maintenance, and the evaluation of nongrease products also studied in the same field test.

The higher torques obtained with car makes W and X are probably due to the lower steering ratios accompanying the power steering units on these makes. Make Y was not equipped with power steering. Because power steering units on makes W and X would have minimized the effects of greases and mechanical components on steering torque, the torque measurements on those cars were made with the power units not operating. Nevertheless, the relative ratings of the greases were the same for all the makes.

Ball Joint Wear

Before the test was started, the ball joints (all new) were coded and measured in a jig specially designed to measure wear. This jig is a modification of a device used at the Southwest Research Institute for measuring the wear of ball joint steering linkages in heavy-duty trucks. The jig makes it possible to measure ball joint wear without disassembly. Since ball joint assemblies are either press-fitted or welded together, disassembling the units for measurement would render them unusable.

In the measuring jig (Figure 3), the distance between an inscribed mark on the stud of the ball joint assembly and the base of the joint is determined with a vernier height gage. To assure accurate measurements, a flat rim is machined at the bottom of each ball joint housing. If wear of either the ball or the socket occurs, the stud sits lower in the housing, producing a decrease in the height of the inscribed mark. This technique is applicable to the lower ball joints, which carry most of the load. Because several different types of ball joints

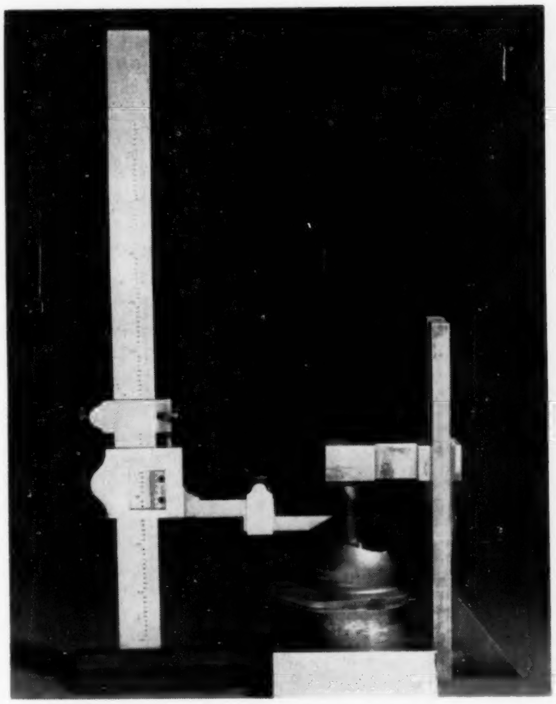


FIGURE 3, jig for measuring wear in ball joints

were used in this test, it was necessary to employ several different bases to hold them in the jig.

All of the lower ball joints showed consistent wear patterns with the exception of those in car make Y. Because these joints are loaded tensively, (as contrasted with the compressive loading of cars in makes W, X, and Z), most of the wear occurred on the upper part of the ball joint; this wear is not observed in our measuring jig.

Average wear measurements for the three greases in the lower ball joints of car makes W, X, and Z showed

TABLE III

Ratings Based on Ball Joint Wear Measurements

Greases	*Average Wear in 1/1000 in.*
A	8.6
B	8.0
C	5.9
Vehicles	
W	3.4
X	13.7
Z	4.5

Conclusion Concerning Relative Wear Rating of Greases	*Confidence Level of Significance*
C Produces less wear than A	90%
C Produces less wear than B	90%
There is no significant difference between A and B	

that grease C produced less wear than greases A and B; no difference was found between greases A and B (see Table III). An analysis of variance shows that the conclusion as to lower wear by grease C has a statistical confidence level of 90 per cent. In every comparison where grease C was used, it produced less wear than either grease A or B. The car makes differed widely in the amount of wear experienced, with make X giving three or four times as much wear as makes W and Z.

The upper ball joints are not subjected to the loads operating on the lower joints, and hence are preloaded with springs or rubber inserts to prevent damage from vibration. Any wear which occurs on the bottom of the ball or on the socket of these joints is taken up by the preloading mechanism, thus making it impossible to measure wear accurately in the jig.* As a result, wear measurements of the upper ball joints, using the jig, showed no consistent relationship among greases or car makes.

Summary of Results

The measurements of steering effort and ball joint wear can be used to compare greases, ball joint designs, or vehicles. These measurements can be performed quite readily, and show performance features that are of concern to the average driver. If a limited test is desired, either steering effort or ball joint wear could be used as the measure of performance.

Use of both of these criteria to measure grease performance is demonstrated by the data reported in this paper. Both steering effort and wear measurements rated grease C best. Steering effort measurements distinguished between greases A and B, though wear measurements did not. The overall ratings are shown in Table IV. We feel that such ratings can be very valuable guides in the development of new products, because they are quantitative, reflect performance under realistic conditions, and measure qualities of importance to the ultimate consumer.

*Any wear that occurs on the upper part of the ball allows the preloading device to push the stud to a higher position than it was originally. This was observed in the field test.

TABLE IV

Overall Ranking of Greases

Steering Effort and Wear

Grease	*Steering Effort Ranking**	*Wear Ranking**
A	3	2
B	2	2
C	1	1

*Ratings are in numerical order representing quality; 1 is best, 3 poorest.

Acknowledgment

We would like to acknowledge the assistance and cooperation of the many individuals who helped us in setting up and conducting the tests described in this paper. In particular, we would like to thank those who took part in designing and constructing the instrumental equipment used for measuring steering torque and ball joint wear.

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2. T. G. Roehner and E. L. Armstrong, *NLGI Spokesman*, May, 1956.
3. L. J. Kehoe, *NLGI Spokesman*, April, 1956.
4. Private communication from Ford Motor Co.

About the Authors

C. L. KNAPP *joined Esso Research in* 1951. *Previously he was employed as an instructor in chemistry at Yale. Dr. Knapp received his PhD from Yale in* 1952. *At the present time he is active in research and development work on grease and other industrial lubricants at Esso Research. He is also a member of ACS and Sigma Xi.*

J. PANZER *received his BA degree in chemistry from New York university in* 1952 *and his PhD in organic chemistry from Cornell university in* 1956. *He then joined Esso Research and Engineering as a research chemist in the industrial lubricants section, studying greases. Dr. Panzer is a member of ACS and Sigma Xi.*

Patents and Developments

Water Resistant Alkali Metal and Alkaline Earth Metal-Containing Grease

Patent 2,831,812 issued to H. J. Worth, and assigned to Union Oil company of California. An exceptionally water-resistant grease is produced by first preparing a magnesium stearate grease, or a concentrate of 10-50 per cent magnesium stearate in SAE 30 oil, and adding thereto, at 210° F. to 250° F., a concentrated aqueous solution of 1-2 equivalents of sodium hydroxide and / or sodium carbonate per equivalent of magnesium stearate. Apparently, metathesis occurs, forming sodium stearate and releasing magnesium in the form of the hydroxide and / or carbonate which remains dispersed or complexed in, and becomes a part of, the final grease composition. Additional oil may be added, to produce a finished grease of the desired soap content, at 265°F. while the mixture is being agitated and the resulting product then is heated to a maximum of 325° F. Finally, the grease is cooled to room temperature with agitation. It is preferred that soaps of fatty acids containing at least about 90 per cent of saturated high molecular weight fatty acids be employed.

Ureido Thickened Greases

Patent 2,832,739 issued to E. A. Swakon, assigned to Standard Oil company (Indiana). Greases that are exceptionally stable at elevated temperatures are claimed to be produced by thickening suitable oleaginous lubricant vehicles with 5-40 per cent by weight of ureido compound having the general formula:

$$Z\text{-}R\text{-}NH\text{-}CO\text{-}NH\text{-}R'\text{-}(NH\text{-}CO\text{-}NH\text{-}R'')_x Z'$$

in which Z and Z′ are terminal reactive radicals consisting of $-NH_2$ or -NCO, $_x$ is an integer 0 to 5, and R, R′ and R″ are the same or different organic radicals such as alkylene, arylene, heterocyclic, or mixtures of such radicals. The ureido compounds are readily obtained by heating a mixture of a polyamine and a polyisocyanate preferably in the equivalent weight ratio of 1:1, at a temperature of 70°-350° F. A reaction product of benzidine with p, p′-diisocyanatodiphenylmethane is given as an example.

Mixed Sodium-Calcium Roller Bearing Grease

Patent 2,832,738 issued to R. F. Nelson and assigned to The Texas company. The patent is based on the discovery that the dropping point deficiency of a mixed sodium-calcium base grease is eliminated by using, as a soap-forming base, a mixture of hydrogenated castor oil and 12-hydroxy stearic acid or its low molecular weight monoalkyl ester in the proportion of 35-70 per cent of hydrogenated castor oil to 30-65 per cent of 12-hydroxystearic acid or ester. The ratio of sodium soap to calcium

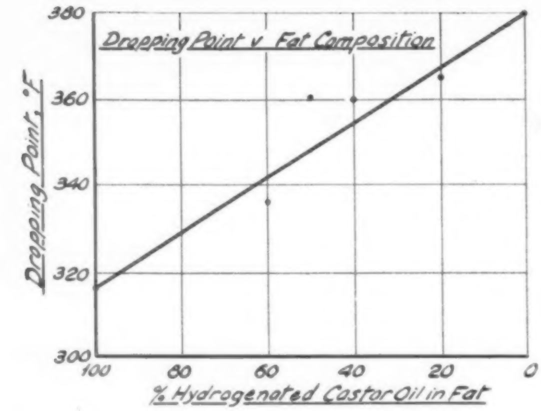

FIGURE 1

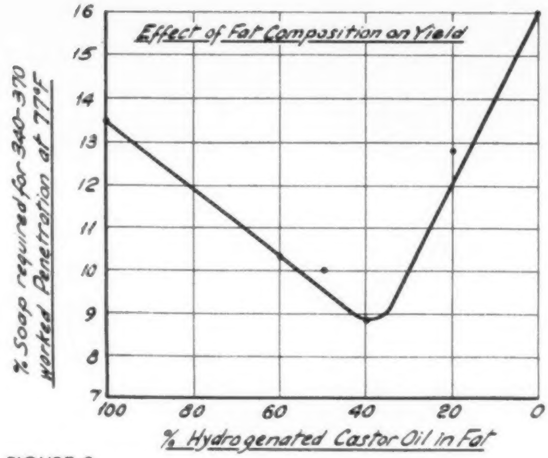

FIGURE 2

soap required for high dropping points and high yields falls within the limits of 3.5:1 to 8:1. It is necessary to control the excess alkali metal hydroxide content of the mixed base grease to below 0.15 weight percent in order to obtain commercially feasible yields while maintaining the dropping point at the desired level. The critical nature of the glyceride-fatty acid mixture on the properties of the resulting mixed sodium-calcium roller bearing grease are shown in Fig. 1. The dropping point increases as the concentration of the 12-hydroxystearic acid increases in the soap-forming component. It is clear from Fig. 1 that the presence of at least 30 weight per cent 12-hydroxy stearic acid in the fat as-

sures a dropping point well over the 325 minimum field requirement. The relationship between 12-hydroxy stearic acid concentration of soap precursor and the yield is shown in Fig. 2, which clearly indicates that the soap concentration in the roller bearing grease usually falls between 8 and 11 per cent meeting the field requirements of a worked penetration of 77° F. between 340 and 370.

Onium Clay Grease Containing Surface Active Agent

Patent No. 2,831,809 issued to W. H. Peterson, and assigned to Shell Development company. Onium clay greases exhibiting improved lubrication and corrosion properties are obtained by the incorporation of 0.5-20 per cent by weight of an oleophilic polyamino oxy compound such as a partial amide of epichlorohydrin and ammonia condensation product. The compound should contain at least 3 nitrogen atoms and oxy groups spaced apart in the molecule by not more than 10 carbon atoms. Such greases should contain 1-20 per cent inorganic nitrite (based on the organophilic bentonite), and 1-20 per cent of an alkaline earth metal hydroxide.

News Items

An estimated 600,000,000 lbs. per year of grease will be used in U.S. passenger autos by 1965, of which 250,000,000 lbs. will probably be lithium based. Development of a good complexed sodium base should minimize the declining use of sodium grease. Use of grease additives is increasing; about 35 per cent of the companies surveyed now use one or all types. Use of solid thickener greases is increasing but generally only for specialties. Solid thickeners will represent 10-20 per cent of the total market "within a few years". About 39 per cent of the grease makers use synthetic fluids as well as conventional oils. (Chem. Wk. 4/12/58 p. 37).

Gulfcrown Grease EP was introduced for bearing applications where high pressures and shock loads exist, or where fretting corrosion might occur (N.Y.J. Comm. 7/23/58).

Anhydrous Calcium Grease

Patent No. 2,831,811 issued to M. M. McCormick and J. W. Nelson, assigned to Sinclair Refining company. Elimination of foaming in the high yield preparation of a smooth calcium base grease in 3-6 hours of processing time, compared to the usual 12 or more hours, is claimed. Lime, solid fatty acid, water and oil are mixed at a low temperature (70°-110° F.), and then heated. Thickening will generally occur at about 120°-145° F., during which time cloudy water begins to appear around the grease kettle at the edge of the grease. The temperature is gradually raised to about 190° F. while the reaction goes to substantial completion; completion of the reaction is indicated by the change in color of the free water from cloudy to clear. Upon completion of the reaction, the mass is partially dehydrated at a temperature of about 190° to 225° F., and additional oil is added while continuing the heating. Thereafter, the reaction mass is dehydrated substantially completely at a temperature preferably of 240°-255° F. When dehydration is complete, heating is stopped, and any additional oil needed is blended into the mixture until the product shows the desired penetration. The water initially added is preferably about 0.5 to 1.0 parts by weight per part of the fatty component of the grease. Ratios of 3:1 of starting oil to fatty component also are preferred. About 5 parts to all of the remainder of the oil to be employed in the final grease are added slowly to the thickened soap-starting oil reaction mass after partial dehydration. Upon complete dehydration of the reaction mass, remaining oil is added to adjust the grease to desired end properties.

Equipment Patents

U. S. 2,840,186 (General Motors Corp.)—Differential drive lubrication system.

U. S. 2,844,287 (W. H. Brandt and E. H. Martin)—Grease gun conversion unit.

People in the Industry

E. F. Houghton & Co. Makes Sales Management Changes

David J. Richards has retired as vice president—sales, and director of E. F. Houghton & Co., Philadelphia, and two other executives have been promoted. The announcement was made following a recent special meeting of the board of directors.

The two other changes are: Frank Ross to vice president—sales, and Charles R. Schmitt to assistant to vice president—sales.

Richards served 41 years with Houghton. Following mechanical engineering studies at the University of Pittsburgh, Richards, who lives in Wynnewood, Pa., worked in the steel mills prior to joining Houghton in 1917. Starting as a salesman, he successively became Pittsburgh sales manager, central division sales manager, assistant director of sales and a member of the board of directors before assuming his most recent position in 1945.

Ross was formerly assistant to the vice president—sales. He came with Houghton in 1942 as divisional manager of lubrication and became national manager of lubrication sales shortly afterward. In 1949 he was named assistant to the vice president—sales, a position he held until being elected vice president at the recent board meeting. He was elected to the board of directors in 1957. He is the firm's NLGI Company Representative.

Schmitt studied mechanical engineering at Case Institute of Technology, Cleveland. He joined Houghton in 1942 as lubrication engineer. A year later he was appointed assistant manager of a divisional lubrication department. In 1951, Schmitt became national manager of the lubrication sales department, a position he will continue to hold in addition to his new responsibilities.

E. F. Houghton & Co. manufactures a broad line of metalworking, heat treating and textile processing products; lubricants; leather belting; leather and synthetic rubber packings; and hydraulic fluids. In

metalworking, Houghton's coolants and quenching fluids are used throughout the world. Its research laboratory has been one of the centers of development for rust preventive fluids since it was the original producer of Cosmoline in 1871.

In hydraulics, it supplies water base, phosphate ester base and water emulsion type fluids for use dependent on the fire hazard; water additive lubricant for valves and packings in closed systems operating with water as a medium; petroleum base fluids reinforced for rust prevention, gum solvency and stability; and hydraulic packings compatible with all these fluids.

Houghton's high temperature lubricants are useful in both the metalworking and the missile field. Various lubricants for use at elevated temperatures have been developed for the U. S. Air Force with the present goal being a lubricant that will withstand temperatures up to 1,000°F.

Graves Joins Vulcan Steel Container

Appointment of Cothran C. Graves to the position of Southeastern regional sales manager of Vulcan Steel Container co. was announced recently by Vulcan president Gordon D. Zuck.

"Cotty" Graves has been in the steel pail and drum business for the past 17 years. He will make his headquarters at the company's main office and plant in Birmingham, Alabama.

The company has recently expanded its production to include all sizes and styles of pails and drums from 1-gallon through 65-gallon.

Southwest Appoints New Service Manager

On August 1, the Southwest Grease & Oil Co., Inc., appointed Jack Hodges as the manager of their service department. He assumes these new duties after three successful years as the company's midwestern sales representative.

In addition to his new duties, Hodges will participate in the im-

portant training and coordination of his territory replacement. It is hoped that his former territory responsibility can be completely transferred by the year's end.

The service department at the "House of Good Grease" under the capable guidance of its new manager, Jack Hodges, stands ready to serve all branded marketers of lubricants.

W. D. Barry Retires

On August 31, 1958, William D. Barry, vice president, member of the board of directors, and eastern division manager, retired from active service with Mallinckrodt Chemical works after a career with this company covering more than 50 years.

After his retirement, Mr. Barry will act as a consultant to the company's general management, and will have an office at 72 Gold Street in New York City. He also remains a member of the company's board of directors.

Succeeding Mr. Barry as eastern division manager, will be John C. Perry, who has been with Mallinckrodt for 32 years. Mr. Perry will have general supervision of eastern division sales, and administrative activities connected with the division's customer service. C. H. Robertson will be eastern division sales manager, and all Mallinckrodt eastern division field representatives and regional sales managers will report to Mr. Robertson.

Mr. Perry will now report directly to John E. Gaston, vice-president.

Assumes New Duties

Mr. Sumner S. Sollitt, president of the Sumner Sollitt company of Chicago, engineers and constructors, announces the appointment of R. N. "Bob" Mullin as director of petroleum industry activities.

Mr. Mullin retired September 1st as division general manager of the Gulf Oil corporation after twenty-five years with that company. He had charge of Gulf's marketing operations in eleven western states with headquarters in Chicago. For a number of years Mullin was division manager for Gulf at Toledo where he had supervision over retail and jobber sales in five states. Prior to his connection with Gulf, he had been Conoco's division manager at Chicago and subsequently Phillips Petroleum company's first Chicago division manager, later eastern regional manager for Phillips with headquarters in Chicago.

Mr. Mullin was a charter member and one of the first presidents of the Texas Independent Oil Man's association and a director in the National Petroleum Marketers association. He was secretary of the Chicago petroleum code committee and in recent years active in OIC and PIC work. In 1956-57 he was state chairman of the OIC in Illinois.

The Sumner Solitt company has been operating under the same family management for over 120 years. The engineering division renders specialty services for the petroleum industry covering engineering studies, economic reports, complete process design and construction services for lube blending and grease plants, light oil marine terminal facilities, and varied designs of CO boiler installations, bottleneck programs, and off-site facilities.

Lubrication Pioneer Has Retired from Esso

Dallas Jennings, of Esso Standard Oil company, who helped pioneer many advances in the fields of greases, lubricating oils and the development of petroleum products for the aviation industry, has retired.

He was one of those most active 30 years ago—when the aviation industry was still in its infancy—in the promotion of uniform specifications and quality, nation-wide, for aviation fuels and lubricants.

For his own company, he not only developed standard specifications for aviation products, but Esso's entire products specifications system.

For the last 13 of his 42 years

with Esso Standard, he was manager of the firm's lubricants and specialties division. For 16 years he was head of the products group in the manufacturing department.

In these capacities, he promoted new methods of grease manufacture were the first forerunners of present-day methods of producing greases with a wider range of applications and temperature-resistance, and helped coordinate Esso's introduction of the first continuous methods of grease manufacture, replacing to a large degree the old "batch" methods.

He was associated with other well-known advances, in the lubricants field, as Esso became the first oil company to produce and market a multi-viscosity motor oil, and including the use of hydrofining as a better method of treating lube oils than the old acid-treating methods.

He established Esso's grease committee, its lubricants committee and its aviation gasoline committee—to help determine product requirements, coordinate uniform quality and specifications and keep such specifications up-to-date, and study the best refining methods to meet them.

He was chairman for varying periods of all three committees, which later became subcommittees of the Standard Oil Company (N. J.) products committee, on which Esso and other Jersey Standard affiliates from this and other countries are represented.

Until his retirement, he was also a member of Jersey Standard's worldwide supply committee and chairman of its aviation fuels supply subcommittee.

Mr. Jennings was a director on a nation-wide board formed by several oil companies in 1928 and 1929, to determine the needs of aviation engines for both fuels and lubricants, establish uniform product specifications, and promote uniform quality standards from coast to coast.

During World War II he coordinated both quality and supply of aviation fuels and lubricants manufactured by Esso for the armed forces. He was the company's representative on aviation matters with the Petroleum Administration for War, and was chairman of the Atlantic Seaboard and Gulf Coast refining division of the P. A. W.'s lubricating oil advisory committee.

Mr. Jennings was also closely associated with the extension of phenol-extraction in this country as a method of removing impurities from lubricating oils, and with some of the earliest work on synthetic turbo-oil production and marketing in the U. S.

He is a former director of Penola Oil Company, Inc., a marketing subsidiary of Esso Standard.

Mr. Jennings reaches 65, retirement age at Esso, this week (September 17). A native of Rockingham County, Va., he attended the University of Virginia and joined Esso, as a chemist, at the old Standard inspection laboratory in Bayonne, N. J. He moved to the New York offices of the lab when he was named its assistant director in 1924.

Mr. Jennings and his wife have been residents of Westfield, N. J., since 1930.

New Group to Market Emery Products

Four additions to the organic chemical sales department staff of Emery Industries have been announced by R. F. Brown, sales manager. Robert S. Haley has been appointed to the New York office; J. Warren Sackett, the Cleveland office; Walter R. Paris, the Lowell, Mass., office; and Robert H. Endres has been assigned to a newly created territory with headquarters in Pittsburgh.

Mr. Haley transfers to the organic chemical sales department from the Vopcolene division, for which he served as eastern sales representative prior to its acquisition by Emery earlier this year. In his new position he will handle all nontextile chemicals in Emery's organic chemical line.

Mr. Sackett was general man-

ager of Bay Rubber & Plastics, Inc., before joining Emry. He will handle Emery's entire organic chemical line in eastern Michigan and state of Ohio except the southeastern portion. A graduate of Ohio State university, Sackett has also taken graduate work at Case Institute of Technology. He is a member of the American Chemical Society, the Society of Plastics Engineers, and the Akron Rubber group.

Mr. Paris went to Emery from Godfrey L. Cabot, Inc., where he was New England sales representative. He will sell non-textile chemicals in all of New England and upper New York state. He is a graduate of Harvard university and a member of the Boston Rubber group, the Rhode Island Rubber group, and the Society of Plastic Engineers.

Mr. Endres formerly was associated with Standard Oil Co. (Indiana). A chemical engineering graduate of the University of Colorado, he is a member of the American Chemical Society and the American Institute of Chemical Engineers. His new territory includes western New York state, western Pennsylvania, West Virginia, and southeastern Ohio.

Rusinko Joins A-D-M

John Rusinko has joined Archer-Daniels-Midland company as manager of newly formed marketing services department, Gene Fowler, director of public relations and advertising, announced recently.

Rusinko formerly was advertising manager of Minneapolis-Moline company. His duties at ADM will include sales communications and training, planning and conducting sales meetings, development of sales aids and sales analysis.

Prior to becoming advertising manager of Minneapolis-Moline in 1956, Rusinko was assistant manager of advertising, sales promotion and public relations for the farm machinery concern. He was chief of public relations for the veterans administration in Seattle, Washington, before that and prior to World War II he was an instructor at the University of Minnesota and a reporter on the Minneapolis *Tribune*.

Wingate Succeeds Towery at Du Pont

William W. Wingate has been named manager of the mid-continent region of the Du Pont company's petroleum chemicals division, with headquarters in Tulsa, Okla. He succeeds Charles D. Towery, who has been manager of both the mid-continent and gulf coast regions and now will devote full time to management of the gulf coast regional office in Houston, Tex.

Mr. Wingate, a native of Woodbury, N. J., joined the Du Pont Company's Industrial Engineering division after obtaining his bachelor of science degree in chemical engineering from the University of Pennsylvania in 1941. With the ex-

ception of three years' service as a Navy submarine officer in the Pacific during World War II, he was engaged in plant development work in connection with Du Pont paints, nylon, and tetraethyl lead until 1949 when he was assigned to the company's Petroleum Chemicals division as a sales-service representative, first in its Eastern district and later the same year in the gulf coast district. In 1954, he was assigned to the division's technical section and two years later was named manager of additives sales in the Mid-Continent Region, a position he held until January, 1957, when he became assistant manager of the Mid-Continent region.

Mr. Towery obtained his bachelor of science degree from Texas A. and M. College in 1932 and prior to World War II was associated with the Pure Oil company and Ethyl corporation. After three years of wartime service in the U. S. Navy as an inspector of petroleum products, he spent two years with Bethlehem Supply company before joining the Du Pont company's Petroleum Chemicals division as a sales-service representative in 1947. Mr. Towery was assigned to the gulf coast region until mid-1950 when he was named manager of the Mid-Continent region. In 1951, he became manager of the gulf coast region, and early last year assumed dual responsibilities as manager of both the gulf coast and Mid-Continent regions.

Fuller Appointed Assistant Sales Manager

Allen T. Fuller, Jr., has been appointed assistant sales manager for the national northern division of American Potash & Chemical corporation, according to an announcement by George S. Wheaton, AP&CC vice-president in charge of defense programs.

Fuller, formerly manager of administrative services for national northern, will work with Jack A. Haynes, sales manager for the division.

T. H. Wrigley has been named to replace Fuller as manager of administrative services.

Hayward Promoted to Regional Sales Manager

Promotion of Robert J. Hayward Jr., New York, to assistant regional sales manager of commodity oils for Archer-Daniels-Midland company was announced by Paul McClay, New York, ADM assistant vice president and regional sales manager.

Hayward, a native of New York and a graduate of Manhattan college, joined ADM as a commodity oils salesman in the New York office in 1954 with the firm's purchase of the resin division of US Industrial Chemicals company.

Industry News

Gulfcrown RR Developed by Gulf

A new railroad car lubricant specifically formulated to provide superior roller bearing lubrication has just been announced by Gulf Oil corporation, Pittsburgh. Developed and tested by Gulf research laboratories, this new lithium soap base grease is now available under the name "Gulfcrown RR."

Gulfcrown RR is one of the first greases to be subjected to the Association of America Railroads' new laboratory tests – designed to be more severe than actual operating conditions. It is approved under AAR Specification M-917-56.

At the AAR's Chicago laboratory, Gulfcrown Grease RR was evaluated for performance in four approved makes of railway journal roller bearings under heavy load at 630 rpm—equivalent to 63 mph on 33-inch car wheels for a time equivalent to 50,000 miles of travel.

Subjected to test conditions calculated to cause early failure of unsatisfactory greases, Gulfcrown RR showed no evidence of high temperature rise within the bearings. Subsequent tests revealed that the grease retained oxidation stability and did not soften.

Gulfcrown RR proved its compatibility with other makes of AAR approved greases in simulated operating conditions involving interchange service, where mixing of grease occurs in the addition of makeup grease to bearings. Mixed with four different makes of greases in proportions of 50 per cent Gulfcrown RR to 25 per cent each of approved makes, there was no evidence of softening when the competitive grades were worked together in the journals.

The new grease, with a typical NLGI consistency of No. 0, is compounded with refined oil and an oxidation inhibitor. Corrosion protection is provided by additives with effective anti-rust properties.

Gear-Lubricant Now In Aerosol Cans

Acrolite Products, Inc., announces a revolutionary new kind of gear grease in push button aerosol cans. This special gear lubricant protects open gears, chains, cams, wire rope, etc.

Called Acrolite Gear-Lube Spray, you simply push the button and spray grease on the gears or other surface. This lubricant forms an extremely tacky surface within minutes after spraying. As the gear rotates, there is a stringy webbing action carried from tooth to tooth by their contact with one another. Rotating of the gears creates a web of strings that continuously stretches across the tooth faces.

The push button aerosol method of application is without fuss or muss and the operator may spray into hard-to-reach places. Gear-Lube is a heavy duty lubricant that can be used on all types of printing machinery, construction machinery, factory marine, farm, and other equipment where there are open gears, cams, wire rope, etc., to be lubricated.

The selling price is $1.95 for a 16-oz. can that is equivalent to three pounds of ordinary grease. Free literature is obtainable by writing Acrolite Products, Inc., 106 Ashland Ave., West Orange, N. J.

Packaging Institute Committee Meeting

The next meeting of the petroleum packaging committee of the Packaging Institute is to be held on October 6 and 7, 1958, in Omaha, Nebraska, as guests of the Socony Mobil Oil company.

All interested petroleum packagers and petroleum marketers are urged to attend. The business meeting will start at 9:00 a. m. on October 6, at the Paxton hotel, and the field trip to the Socony Mobil packaging plant will be held the following day.

Lincoln Announces New 100 Per Cent Automatic Electric Power Lubrication Systems

Fully automatic and electrically operated, two new centralized lubrication systems—called "Electro-Luber"—have been introduced by the Lincoln Engineering company, St. Louis. The systems are designed to provide high or low pressure centralized power lubrication for all industrial machinery.

Lincoln reports that Electro-Lubers are compact and highly efficient in supplying oil or grease to banks of injectors in a centralized lubrication system. The operation is entirely electrical and 100 per cent automatic. Also it is comparatively low in cost. This makes centralized lubrication possible for many plants and machines that previously were limited to inadequate methods of manual lubrication, or where compressed air is not available, company officials stated.

Electro-Luber Systems are especially suited for service on individual machines, because they become an integral part, making self-lubrication a part of the machine's normal operation.

One outstanding feature of these new systems is the safety shut-off that operates automatically if the pump runs dry or a supply line breaks. Various types of alarm devices, such as lights, buzzers, bells, etc., can be installed to call attention to the situation.

Electro-Luber pumps weigh 65 pounds and can be mounted in less than one-half square foot of space. Two model pumps, 1000 p.s.i. and 2,900 p.s.i. maximum pressure, are available. Powered by a ¼ HP motor, Electro-Luber will lubricate up to 1000 bearings in seconds.

Complete information on Electro-Luber may be obtained by writing for Bulletin 815, Lincoln Engineering company, 5702-30 Natural Bridge avenue, St. Louis 20, Missouri.

New Remote Control Barrel Handler

The Stratton Equipment company, Cleveland, Ohio, introduces the Barrel Lifter-Tipper-Stacker. This unit lifts drums or barrels to any desired height, then by remote control, the drum is tipped forward or backward or revolved in a complete 360-degree circle.

The unit is quickly adjusted to fit any size drum or barrel and attaches instantly while the drum is in either a horizontal or vertical position. Tipping action is very sensitive and can be controlled extremely accurately.

The barrel handler unit is easily removed from the Stratton Multi-

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Continental puts extra service into every steel container

From advanced research to faster delivery, Continental container service smooths your shipping problems

Continental gives you the highest quality steel containers *plus* the benefits of famous Continental service. You deal with a Continental expert who knows the problems of the petroleum industry. You order from a complete line of steel containers, superbly lithographed for powerful sales appeal. You get fast delivery of all the containers you need, when you need them. And if you have a special problem, Continental's research and engineering services help you solve it. Let us show you what we mean by famous Continental service. Call today.

Exclusive Perma-Lining enamels provide 100% protection for hard-to-hold petroleum and chemical products. Perma-Lined containers are airless hot sprayed *after fabrication* to prevent corrosion-causing cracks and assure 100% complete interior coverage. In tight or open head pails—with lug, ring seal or lever lock covers.

CONTINENTAL CAN COMPANY

Eastern Division: 100 E. 42nd St., New York 17
Central Division: 135 So. La Salle St., Chicago 3
Pacific Division: Russ Building, San Francisco 4

Lift, which can then be instantly converted to a forklift, platform or crane. The Stratton Multi-Lift is also available with a hydropower wheel for motivation or travel. The entire operation is powered by a 12 volt heavy duty industrial battery.

The Stratton Equipment company, 2030 East 105th street, Cleveland 6, Ohio.

Improved Mixers

An improved line of changeable can mixers featuring vacuum tight covers has been announced by Charles Ross & Son company, Inc. The mixers incorporate double planetary stirrer action for greatest compressive and shearing action, and in addition to special mixers can be provided with jackets on cans for heating and cooling material during mixing when required. The No. 130-EL one gallon mixer can be furnished with special oversized ½ or ¾ horsepower variable speed motor drive to produce results comparable to those obtainable in heavy duty double arm kneaders. Mixers are driven by variable speed motor drive and are obtainable in various sizes from the one gallon laboratory size up to 150 gallon working capacity size.

New Blend of Alcohols

Werner G. Smith, Inc., announces a new blend of fatty alcohols and fatty acids in three grades. These new products, called Oleyl-Acids and Cetyl-Acids, are derived from sperm oil and are composed of fatty alcohols, fatty acids, and contain a small amount of esters.

The alcohols may be reacted with phosphoric acid to give extreme pressure properties and the fatty acids converted to zinc soap to further enhance the lubricant additive properties. The unsaturated grade may be sulfurized, before reacting, to form the phosphorus-zinc compounds, as a step in processing.

By adding ethylene oxide to both the alcohols and fatty acids, a water emulsifiable compound may be formed for detergents, textile chemicals, paper chemicals, cutting oils, lubricants, hydraulic fluids and drawing compounds. The fatty alcohols are excellent lubricants and emulsion stabilizers.

The fatty acids may be converted to the amines and the fatty alcohols used as super fatting agents and to help stabilize emulsions. The OH (hydroxyl) group of the alcohol has an affinity for oil to act as an emulsion stabilizer or coupling agent.

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NLGI Associate, Technical Members

CONTAINER AND CLOSURE MANUFACTURERS

American Can Company
100 Park Avenue, New York 17, N. Y.
Representative—H. T. Rich

American Flange & Manufacturing Company, Inc.
30 Rockefeller Plaza, New York 20, N. Y.
Representative—Richard L. Parish, Jr.

Bennett Industries
Peotone, Illinois
Representative—S. A. Bennett

Central Can Company
2415 West 19th St., Chicago 8, Illinois
Representative—Henry Frazin

Cleveland Container Company
4925 So. Halsted St., Chicago 9, Ill.
Representative—R. D. Sayles

Continental Can Company, Inc.
100 East 42nd St., New York 17, N. Y.
Representative—W. J. Flint

Geuder, Paeschke & Frey Company
324 North Fifteenth St., Milwaukee 1, Wis.
Representative—Neil Savee

Inland Steel Container Company
6532 South Menard Ave., Chicago 38, Ill.
Representative—J. Daniel Ray

Jones & Laughlin Steel Corporation
Container Division
405 Lexington Ave., New York 17, N. Y.
Representative—C. K. Hubbard

National Steel Container Corp.
6700 South LeClaire Ave., Chicago 38, Ill.
Representative—Henry Rudy

The Ohio Corrugating Company
917 Roanoke Ave. S. E., Warren, Ohio
Representative—Lawrence F. McKay

Republic Steel Corporation
Container Division
465 Walnut Street, Niles, Ohio
Representative—Theodore Humphrey

Rheem Manufacturing Company
400 Park Ave., New York 22, New York
Representative—F. J. Blume

Rieke Metal Products Corporation
Auburn, Indiana
Representative—Glenn T. Rieke

Steel Package Division of National Lead Company
722 Chestnut Street, St. Louis 1, Missouri
Representative—Warren T. Trask

United States Steel Products
Division, United States Steel Corporation
30 Rockefeller Plaza, New York 20, N.Y.
Representative—Wm. I. Hanrahan

Vulcan Containers, Inc.
P. O. Box 161, Bellwood, Illinois
Representative—L. M. Ferguson

ENGINEERING SERVICES

The C. W. Nofsinger Company
307 East 63rd Street, Kansas City 13, Missouri
Representative—C. W. Nofsinger

Sumner Sollitt Co.
307 N. Michigan Ave., Chicago 1, Illinois
Representative—A. J. Barth

MANUFACTURERS OF EQUIPMENT FOR APPLICATION OF LUBRICATING GREASES

Balcrank, Inc.
Disney near Marburg, Cincinnati 9, Ohio
Representative—Richard P. Field

The Farval Corporation
3249 East 80th St., Cleveland, Ohio
Representative—Lee Witzenburg

Gray Company, Inc.
60 Northeast 11th Ave., Minneapolis 13, Minn.
Representative—B. A. Beaver

Lincoln Engineering Company
5701 Natural Bridge Ave., St. Louis 20, Mo.
Representative—G. A. Hubbard

Stewart-Warner Corporation
Alemite Division
1826 Diversey Parkway, Chicago 14, Illinois
Representative—E. G. Wicklatz

Trabon Engineering Corp.
28815 Aurora Rd., Solon, Ohio
Representative—E. W. Baumgardner

MARKETING ORGANIZATIONS

Ampol Petroleum, Ltd.
Buchanan Street
Balmain, New South Wales, Australia
Representative—L. Ashley

California-Texas Oil Company
380 Madison Ave., New York 17, New York
Representative—Hal U. Fisher

Canadian Petrofina Limited
505 Dorchester Street West
Montreal, Quebec, Canada
Representative—M. E. Wight

Cooperative GLF Exchange, Inc.
Terrace Hill, Ithaca, N. Y.
Representative—W. S. Miller

Denco Petroleum Company
5115 Denison Avenue, Cleveland 2, Ohio
Representative—I. L. Carmichael

Derby Refining Co.
420 West Douglas, Wichita, Kansas
Representative—W. B. Neil

D-X Sunray Oil Company
Mid-Continent Bldg., P. O. Box 381, Tulsa, Okla.
Representative—J. W. Basore

Farmer's Union Central Exch., Inc.
P. O. Box G, St. Paul 1, Minnesota
Representative—H. F. Wagner

Illinois Farm Supply Company
100 East Ohio Street, Chicago, Illinois
Representative—S. F. Graham

Ohio Farm Bureau Cooperative Association, Inc.
245 North High Street, Columbus 16, Ohio
Representative—Walter N. Callahan

Valvoline Oil Company
Division of Ashland Oil & Refining Co.
Box G, Freedom, Pennsylvania
Representative—D. A. Smith

SUPPLIERS OF EQUIPMENT FOR MANUFACTURING LUBRICATING GREASES

Barrett Manufacturing Company
P. O. Box 8096, Houston 4, Texas
Representative—George J. Barrett, Jr.

Chemicolloid Laboratories, Inc.
55 Herricks Road, Garden City Park, N. Y.
Representative—David F. O'Keefe

Girdler Process Equipment Division, Chemetron Corp.
P. O. Box 43, Louisville 1, Kentucky.
Representative—J. E. Slaughter, Jr.

Manton-Gaulin Mfg. Co., Inc.
44 Garden Street, Everett 49, Massachusetts
Representative—J. J. Dwyer

NLGI Associate, Technical Members

Stratford Engineering Corporation
612 W. 47th Street, Kansas City 12, Missouri
Representative—D. H. Putney

Struthers Wells Corp.
1003 Pennsylvania Ave. West, Warren, Pa.
Representative—K. G. Timm

SUPPLIERS OF MATERIALS FOR MANUFACTURING LUBRICATING GREASES

American Cyanamid Company
30 Rockefeller Plaza, New York 20, N. Y.
Representative—B. H. Loper

American Potash & Chemical Corp.
99 Park Avenue, New York 16, N. Y.
Representative—W. F. O'Brien

Archer-Daniels-Midland Company
Chemical Products Division
P. O. Box 532, Minneapolis 40, Minn.
Representative—J. H. Kane

The Baker Castor Oil Company
120 Broadway, New York 5, New York
Representative—J. W. Hayes

Baroid Chemicals, Inc.
A subsidiary of National Lead Company
1809 South Coast Life Building
Houston 2, Texas
Representative—Mr. C. M. Finlayson

Godfrey L. Cabot, Inc.
77 Franklin Street
Boston 10, Mass.
Representative—H. P. Donohue, Jr.

Climax Molybdenum Company
500 Fifth Ave., New York 36, New York
Representative—Elwin E. Smith

Darling & Company
4201 South Ashland Ave., Chicago 9, Illinois
Representative—G. W. Trainor

E. I. du Pont de Nemours & Co.
Wilmington, Delaware
Representative—R. O. Bender

The Elco Lubricant Corporation
Jennings Road & Denison Avenue
Cleveland 9, Ohio
Representative—R. K. Smith

Emery Industries, Inc.
4300 Carew Tower, Cincinnati 2, Ohio
Representative—G. W. Boyd

Enjay Company, Inc.
15 West 51st St., New York 19, New York
Representative—Brian Casey

Foote Mineral Company
18 W. Chelten Ave., Philadelphia 44, Penn.
Representative—W. F. Luckenbach

A. Gross and Company
295 Madison Avenue, New York 17, N. Y.
Representative—Eugene W. Adams

The C. P. Hall Company of Illinois
5145 West 67th St., Chicago 38, Illinois
Representative—J. E. Stonis

Harchem Division
Wallace & Tiernan, Inc.
25 Main St., Belleville, N. J.
Representative—W. G. McLeod

Humko—Chemical Department
P. O. Box 4607
Memphis 7, Tennessee
Representative—W. J. O'Connell

Lithium Corporation of America, Inc.
Rand Tower, Minneapolis 2, Minnesota
Representative—Malcolm M. Moore

The Lubrizol Corporation
Box 3057—Euclid Station, Cleveland 17, Ohio
Representative—J. L. Palmer

Mallinckrodt Chemical Works
2nd & Mallinckrodt Sts., St. Louis 7, Missouri
Representative—D. B. Batchelor

The McGean Chemical Co.
Midland Building, 101 Prospect Ave., N. W.
Cleveland 15, Ohio
Representative—W. A. Ritchie

Metasap Chemical Company
A Subsidiary of Nopco Chemical Co.
60 Park Place, Newark, New Jersey
Representative—T. J. Campbell

Monsanto Chemical Company
800 North Twelfth Blvd., St. Louis 1, Mo.
Representative—J. W. Newcombe

Newridge Chemical Company
7025 West 66th Place, Chicago 38, Illinois
Representative—T. E. Shine

M. W. Parsons—Plymouth, Inc.
59 Beekman St., New York City 38, New York
Representative—Herbert Bye

Synthetic Products Company
1636 Wayside Rd., Cleveland 12, Ohio
Representative—Garry B. Curtiss

Swift & Company
165th & Indianapolis Blvd., Hammond, Ind.
Representative—F. H. Beneker

Vegetable Oil Products Co., Inc.
Vopcolene Division
5568 East 61st Street, Los Angeles 22, Calif.
Representative—C. F. Williams

Witco Chemical Company
122 East 42nd St., New York 17, New York
Representative—E. F. Wagner

TECHNICAL AND RESEARCH ORGANIZATIONS

Battelle Memorial Institute
505 King Avenue, Columbus 1, Ohio
Representative—S. L. Cosgrove

Compagnie Francaise De Raffinage
11 Rue du Dr. Lancereaux, Paris VIII^e, France
Representative—Albert E. Miller

Inland Testing Laboratories
6401 Oakton St., Morton Grove, Ill.
Representative—Dr. Morton Fainman

Institut Francais du Petrole
CMrR—Courtel, 4 Place Bir Hackeim
Rueil—Malmaison (S. et Oise) France

Laboratoires de Recherches Purfina S.A.
98/100 Chaussee de Vilvorde,
Bruxelles (N.O.H.), Belgium
Representative—R. Gillerot

Petroleum Educational Institute
9020 Melrose Avenue, Los Angeles 46, Calif.
Representative—G. A. Zamboni

Phoenix Chemical Laboratory, Inc.
3953 W. Shakespeare Ave., Chicago 47, Ill.
Representative—Mrs. G. A. Krawetz

Products Development Laboratory
1 Market St., West Warwick, Rhode Island
Representative—Alberic T. DiMasi

Veresit—Fabrica de Productos Quimicos S.R.L.
Monasterio 271, Buenos Aires, Argentina
Representative—Dr. Alexander Erdely

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By sulfonation, wetting agents are produced having unusual properties. It is possible to sulfate the alcohol and sulfonate the unsaturated bonds and increase the SO_3 content, or get unusual properties by sulfating the OH group of the saturated grade.

Bennett Industries to Demonstrate Improvements

This year Bennett Industries, Inc., of Peotone, Illinois, will demonstrate many new improvements in the container field during the Paint Industries show in Cleveland on October 6, 7, and 8. At their Booth 98-99 will be: S. A. Bennett, president, Harry F. LePan, vice-president, Robert R. Ernst, general sales manager, Jack A. Kapsa and Leonard A. Kuckie, district managers.

A new pail package unit, Handy-Pak, will be shown. Two men can carry the Handy-Pak easily or it may be dragged by one man or carried mechanically. When packaged in Handy-Pak, pail scuffing and denting is practically eliminated. This Bennett pail package unit can save considerable handling time, representing a cost savings up to $80.00 per carload on each handling.

Bennett Industries will show the Chapco Print-A-Can printer which prints instructions, identifications, etc., on five-gallon pails. One inexperienced operator can print up to 500 pails per hour on the portable Chapco Print-A-Can printer.

Another new item for this show is the automatic pail closing machine, developed by Bennett Industries. It feeds the pail into the machine, closes the 16-lug cover and ejects the pail from the machine, with a production of up to 1000 units per hour.

In addition, Bennett's full line of pails and drums will be on display, featuring hi-bake linings, phosphatizing, wide-lug covers, and many other improved features for pails and drums.

Alpha-Molykote Announces New Gas Valve Lubricant

Molykote type 1102 a new gas valve lubricant, has been announced by the Alpha-Molykote corporation, Stamford, Conn.

The new lubricant which was developed and tested to meet exacting requirements of gas associations, is a high-temperature non-melting-point grease fortified with highly purified molybdenum disulfide powder.

This grease is recommended for use as a lubricant for plug cocks of metal, plastics or glass on equipment where reliable lubrication in the presence of gases or liquids is required. It eliminates the gumming formations which usually cause valves to stick.

Molykote type 1102 is resistent to propane, butane, natural gas, manufactured gas, ethyl alcohol, methyl alcohol, dilute potassium hydroxide, dilute sodium hydroxide, dilute nitric acid, concentrated hydrochloric acid as well as boiling water and steam.

It is attacked by aliphatic, aromatic and chlorinated hydrocarbons such as gasoline, diesel oil, petroleum, benzene, toluol, xylol, trichloroethylene, esters and aliphatic fatty acids.

Bel-Ray to Erect Modern Grease Mfg. Plant

Bel-Ray, Incorporated, of Madison, New Jersey, manufacturers of

special application lubricants, has recently acquired a tract of 60 acres in Randolph township, N. J., and will break ground soon to erect one of the most modern grease manufacturing plants on the east coast.

The new fireproof building will contain the latest grease manufacturing equipment, conveyorize system, and blending weighing facilities. Attached to the building, which will be campus style, will be an ultra-modern laboratory with facilities for up-to-date grease testing and evaluating equipment.

Bel-Ray also plans to have excellent railroad siding facilities available. From their new location they will be able to ship by rail or commercial carrier and will facilitate export shipments. Completion of the building is contemplated for approximately January, 1960.

Elcide 75 Being Marketed

A bacterial inhibitor that will extend the life of soluble oil emulsions two to four times or more has been announced. Called Elcide 75™, the product is a development of the applications research department of the Lilly research laboratories. Now produced in quantity, Elcide 75 is being marketed direct to United States and Canadian industrial concerns by the agricultural and industrial products division of Eli Lilly, Indianapolis. A patent is pending on the new product.

G. L. Varnes, the division's executive director, said that "on the basis of shop evaluations we have completed, it looks like this new bacterial inhibitor will be an important factor in helping hold down costs of cutting oils and emulsions."

According to Varnes, "Substantial savings should result from the extended life of emulsions and the labor costs involved in making emulsion changes."

Lincoln Offers New Bulletin On Precision Measuring Valve System

A new illustrated bulletin on precision measuring valve systems has just been published by Lincoln Engineering company of St. Louis, Mo. Designed to help solve problems in dispensing measured quantities of fluid and semi-fluid materials, the systems provide advanced "rapid recovery performance" that speeds up assembly operations. For this reason they are readily adaptable to fully automated operations.

Applications include—filling gear cases, small transmissions, machine bearings, electric motor bearings, and applying insulation and sealing compounds. These systems may be permanent or portable, and will dispense as little as 1/20 oz. or more than two quarts per application.

The new Lincoln bulletin offers engineering data on different types of valves, including the multi-measure, heavy duty, high pressure measuring valve; the four-way hydraulic control valve; a complete measuring valve system; and portable or stationary lever-type valves for measuring smaller amounts of materials.

Mayor has served on the board since 1953, has also worked on ten NLGI committees, and is now serving as publicity committee chairman.

Nomination of the newly created position of secretary, if approved, was given to Dr. J. V. Starr, assistant to the manager of the petroleum specialties department, Esso Standard Oil. Dr. Starr, a board member since 1954, has served on a number of committees and is presently chairman of the NLGI production survey committee . . . a position he also held last year.

Board members nominated include: T. W. Binford, British American; E. W. Campbell, Gulf Oil; R. Cubicciotti, L. Sonneborn; A. G. Griswold, Cities Service; F. R. Hart, Standard of California; C. L. Johnson, Jesco Lubricants; W. A. Magie, 2nd., Magie Bros.; H. A. Mayor, jr., Southwest Grease and Oil; A. S. Randak, Sinclair Refining; and L. R. Woolsey, British American Oil.

RESOLUTION—Proposed Amendments to the Constitution and By-Laws of the NLGI

Resolved, That the By-Laws of National Lubricating Grease Institute be and the same are hereby amended in the manner and to the extent hereinafter set forth, viz:

1. That Article I, Section 1, Par. 1 be amended so as to read as follows:

   1. The property and affairs of the Institution shall be controlled and managed by a Board of Directors composed of not more than twenty-four members to be elected at the Annual Business Meeting, from the duly qualified representatives of Active Members by a majority of the Active Members present and voting or voting by proxy.

2. That Article I, Section 1, Par. 2 be amended so as to read as follows:

   2. Directors shall be elected for terms of three years and so arranged in groups that at each Annual Business Meeting one-third of such Directors shall be elected to replace a like number whose terms then expire.

3. That Article I, Section 3, be amended so as to read as follows:

Section 3—Officers and General Manager

   1. At the first meeting of the Board of Directors following the election of Directors at the Annual Business Meeting, the Board shall elect a President, a Vice-President, Secretary and a Treasurer of the Institute, by majority vote of the Members present and voting, to serve for a term of one year or until their successors are elected and qualified.

   2. Interim vacancies occurring in any one of said offices shall be filled by the Board by majority vote of the members present and voting at any meeting. Any officer thus elected to fill any interim vacancy shall hold office for the unexpired term of his predecessor and until his successor is elected and qualified.

   3. A General Manager shall be employed by the Board of Directors. The Board shall fix his compensation and term of employment.

4. That Article I, Section 5, Par. 1 be amended so as to read as follows:

   1. One-half of the members of the Board shall constitute a quorum to transact business for any meeting.

5. That Article I, Section 12, Par. 1 be amended so as to read as follows:

   1. The Board shall present to each Annual Business Meeting a general report concerning the affairs of the Institute and its operations during the past year. Copies of this report, together with copies of the Annual Reports of the Secretary, Treasurer, the Finance Committee and the General Manager, shall be mailed to each member of the Institute.

6. That Article II—Officers, be amended so as to read as follows:

   Article II— *Officers and General Manager*

7. That Article II, Section 1, Par. 6 be amended so as to read as follows:

   6. The President, with the General

Manager, shall arrange for the employment of such personnel as may be needed to carry on the work of the Institute with the exception of the General Manager, who is to be appointed by the Board of Directors.

8. That Article II, Section 3 of the present By-Laws be renumbered Article II, Section 4 without change.

9. That a new Article II, Section 3 be adopted so as to read as follows:

Section 3—The Secretary

1. The Secretary shall in the absence or disability of the President and Vice President, perform the duties of President and shall perform such other duties as may be assigned to him by the Board of Directors

2. The Secretary shall cause to be recorded all votes taken and minutes of all proceedings kept in the minute book of the Institute to be kept for that purpose. He shall see that all books, records, and papers of the Institute are kept and made available for inspection at the location of the headquarters office of the Institute.

3. The Secretary shall be a member of the Executive Committee.

4. The Secretary shall be a member ex officio of all other committees.

10. That Article II, Section 4 of the present By-Laws be renumbered Article II, Section 5 and amended to read:

Section 5—General Manager

and that Par. 1 thereof be amended to read as follows:

The General Manager shall be employed by the Board of Directors and shall devote his full time and best efforts to the business of the Institute and that Par. 2 thereof be amended to read as follows:

2. The General Manager shall have charge of the headquarters office, including office records and equipment; he shall employ and supervise the work of employees in the headquarters office; he will handle the affairs and work of the Institute, subject to the direction of the President and subject to the approval of the Board of Directors. He shall have power subject to the approval of the President or the Board of Directors to purchase supplies and equipment as may be needed to carry out the work of the Institute.

11. That Article III, Section 1, Par. 2 be amended so as to read as follows:

The Executive Committee shall include:

The President
The Vice President
The Secretary
The Treasurer
The Chairman of the Membership Committee
The Chairman of the Technical Committee

12. That a new Article VIII be adopted so as to read as follows:

ARTICLE VIII—*Waiver of Notice*

Any Notice provided or required to be given to the Board of Directors or to the Active, Associate, Technical or Marketing Members may be waived in writing by any of them whether before, at or after the time stated therein.

13. That the term "Executive Secretary" be amended to read "General Manager" wherever it appears in the By-Laws, with specific reference to the following provisions not hereinabove mentioned:

Article I, Section 10, Par. 1
Article II, Section 4 (renumbered Section 5) and paragraphs 3 through 17
Article III, Section 2
Article VII

RESOLUTION

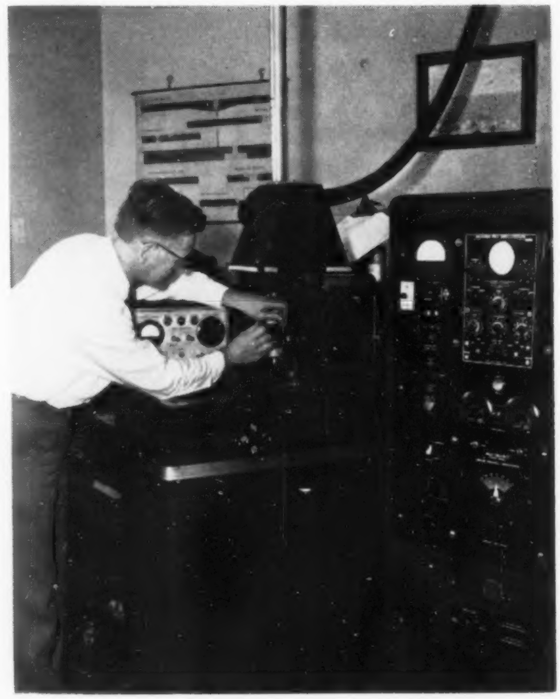
RESOLVED, That the Constitution of National Lubricating Grease Institute be and the same is hereby amended in the manner and to the extent hereinafter set forth, namely:

That the term "Executive Secretary" be amended to read "General Manager" wherever it appears in the Constitution with specific reference to the following provisions:

Article IV, Sec. 1, Par. 1 (a) (4)
Article IV, Sec. 1, Par. 1 (a) (7)
Article IV, Sec. 2, Par. 2
Article IV, Sec. 2, Par. 3
Article V, Sec. 3, Par. 1
Article V. Sec. 5, Par. 1
Article V, Sec. 6, Par. 1
Article V, Sec. 7, Par. 1
Article VI, Sec. 2, Par. 2
Article VII

New Member

Waverly Oil Works Joins the Grease Institute



INTERIOR view of plant, the Waverly Oil Works company.

The grease and compounding plant of the Waverly Oil Works company is located at Bakerstown, Pennsylvania, approximately eighteen miles north of Pittsburgh, Pa. It is situated on a six-acre tract of land, with three buildings for manufacture, warehousing, garage and office, covering approximately 17,000 square feet of floor space.

It has ideal transportation facilities, being serviced by the B. & O. Railroad (having a 6-8 car private siding), and being only about two miles distant from the Pennsylvania turnpike, Route 8 intersection.

The plant was built primarily for the manufacture of lubricating greases and compounding oils, serving steel and associated industries. The manufacturing equipment consists of a number of grease kettles, ranging from 100 gallons to 2,200 gallon capacity; also several blending and compounding tanks of 2,000-8,000 gallon capacity.

The kettles, suspended from a mezzanine floor, are Patterson kettles equipped with double agitators, driven by 40 HP explosion proof induction motors operating at 440 Volts A.C. All kettles and compounding tanks are electrically heated with sectional strip heaters, fastened to the outside of the kettles or tanks and heavily insulated by several layers of glasswool.

A very elaborate electrical control system, with temperature recording instruments and multipoint pyrometers, gives constant and positive manufacturing control.

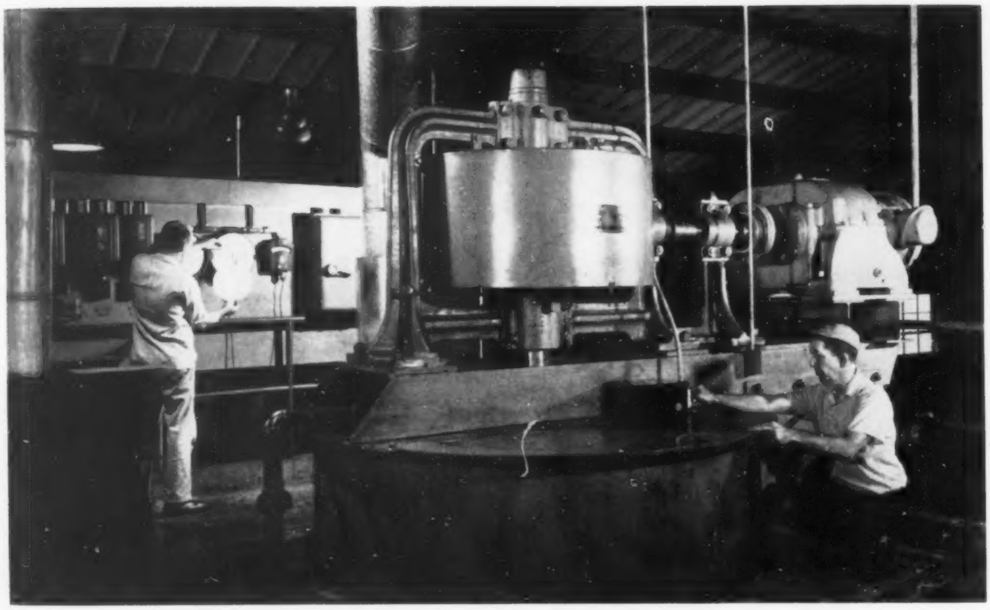
All kettles are vented to the outside and connected to a suction fan and scrubbing tower to eliminate any odor nuisance.

Most of the oil storage tanks are housed inside the manufacturing building, in a specially insul-

NLGI Company Representative for the Waverly company is Dr. W. T. Sieber.

Dr. W. T. Sieber is a graduate of the University of Heidelberg, Germany, where he majored in organic chemistry and physics. Prior to 1924 he was connected with the Atlantic Refining company, Pittsburgh plant, where he became familiar with all phases of refinery technique. Since 1924 he has been associated with the Waverly Oil Works company, being in charge of manufacturing, and research and development. He also acts as technical adviser to the sales department. He is the author of several technical papers and is a member of the American Chemical Society, the American Society of Testing Materials, and is the NLGI company representative for Waverly.

Waverly Oil Works Joins NLGI —cont'd



MODERN equipment, latest improvements, and an oil industry record for over 78 years.

ated room which is heated by circulating hot air and kept at a constant temperature of approximately 130-140° F. The oils are pumped from these storage tanks by means of Blackmere pumps and metered by Pittsburgh Equitable meters.

The finished grease, after being tested and OK'd by the control laboratory, is drawn from the bottom of the kettles by Moyno pumps, double strained or homogenized (Manton-Gaulin homogenizer), filled into drums on manually controlled scales, and palletized for either immediate shipment or storage in the warehouse.

A medium size one quart and five quart can filling and sealing equipment is located on the first floor of the manufacturing building where drum filling also is situated. All filling of lubricating oils is done by meters which are equipped for temperature compensation.

The plant handles all kinds of lubricating greases and oils efficiently and economically, and the equipment permits the manufacture of quantities from 200 lbs. to 20,000 lbs. at one time.

Waverly manufactures all types of lubricants for industrial and automotive uses, but has quite a reputation for its E. P. leaded products, High temperature grease, cutting oils and other specialty products, as well as its "WOW" brand of Pennsylvania Motor oils.

Waverly is not a newcomer in the oil industry. It was started in 1880 and has been engaged in grease manufacture since 1920, during which time it has obtained quite a reputation for quality of its products.